Indian and Northern Affairs Canada
Affaires indiennes et du Nord Canada

EXPLORATION OVERVIEW

Mining, Exploration and Geological Investigations

NORTHWEST TERRITORIES 1985

GEOLOGY DIVISION
NORTHERN AFFAIRS PROGRAM
YELLOWKNIFE N.W.T
(January 1986)

Published under authority of
the Hon. David Crombie
Minister of Indian Affairs
and Northern Development

Canada

EXPLORATION OVERVIEW

MINING, EXPLORATION AND GEOLOGICAL INVESTIGATIONS

NORTHWEST TERRITORIES, 1985

RESUME

Ce rapport de l'activité minière en 1985 comprends deux sections. La première section décrit les fonctions de la Section de la Geologie du Programme des Affaires du Nord (AINC, Yellowknife) et offre une description sommaire des travaux d'exploitation et d'exploration minière entrepris dans les Territoires du Nord-Ouest (TNO) en 1985. La deuxième section comprend une brève description de quelques un des projets géologiques entrepris par des entrepreneurs associés aux universités sous l'égide de la Section de la Geologie et les résumés de quelques unes des presentations qui vont être données au cours du "13th Geoscience Forum". Le programme des presentations pour le colloque est aussi inclut.

En 1985, les onze unités de traitement de minerai aux TNO ont produit presque $800 million de métaux. Près de $40 million ont été dépensés en exploration minière cette année et une forte proportion de cette somme a été depensé dans la recherche de gisements d'or dans la Province des Esclaves.

THIS OVERVIEW IS AVAILABLE BY MAIL FROM:

GEOLOGY DIVISION
NORTHERN AFFAIRS PROGRAM
DEPT. OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT
PO BOX 1500
YELLOWKNIFE, NWT
X1A-2R3

Price: No charge

PART 1 - MINING AND EXPLORATION OVERVIEW, 1985

INTRODUCTION

W.A. Padgham, Chief Geologist
Northern Affairs Program, Geology Division
Yellowknife, Northwest Territories

The Geology Division of the Northern Affairs Program, Indian and Northern Affairs Canada, administers the provincial level responsibilities for geology and for the mining and mineral exploration industries within the Northwest Territories. Oil and gas developments are administered by COGLA, a joint INAC-EMR group, but coal is under INAC.

The Geology Division, besides monitoring mining and mineral exploration, collects data on these operations, and maintains an extensive archive on the general geology of the territory. A Core Library, designed to preserve samples of Northwest Territories' rocks and mineral deposits, is also maintained. Information, or access to the information and other materials held in the libraries, is provided on request.

A major part of the Division's effort goes into providing advice and assistance to prospectors and mineral explorationists who are working in the Northwest Territories. This Overview of mining, exploration, and geological work (by the Division's staff and contractors) is published yearly.

Lengthier reports on mining and mineral exploration (Mineral Industry Report for the Northwest Territories) and on geological work (Contributions to the Geology of the Northwest Territories) are also published on a regular basis. These summarize the assessment work filed on mineral claims and prospecting permits, and the results of geological and mineral resource development work. Preliminary geological maps and reports are released in an open file format as they become available.

DIVISION ACTIVITIES, 1985

During 1985, four District Geologists monitored mineral exploration in the 3.24 million square kilometres of the Northwest Territories. As few areas are accessible by road, most of this work requires aircraft transportation.

Extensive geological programs are supported each year by the NWT Geology Division. District geologists conduct property investigations and describe the showings they have visited for inclusion in our Archive. Various other projects are conducted by Division staff, contract personnel, and summer students.

In 1985, P.J. Laporte, Keewatin District Geologist, sampled rocks in the Tehek area to test its gold potential. Approximately 200 samples will be assayed for Au, Ag, Pb, Zn, Cu, Ni, W, and As.

Dr. Walter A. Gibbins, Arctic District Geologist, studied carvingstone sites in the northern Slave Province around Bathurst Inlet and Hope Bay. With Professor D. Hogarth, he also investigated Frobisher's old mine sites near Frobisher Bay on Baffin Island (Canada's first "Public" mining venture).

Field work by Division staff, students and contractors was concentrated in the Slave Structural Province.

Mapping and geological studies in the Yellowknife Volcanic Belt and adjacent rocks included work by:

C. Relf, with T.A. Rivers*, mapped the Mirage Islands, the southernmost part of the Yellowknife belt. A geological map and report on this, the only unmapped portion of the belt, is expected.

G. Bailey continued his study of Kam - Banting - Jackson Lake stratigraphic relationships.

H. Helmstaedt* continued field checking for compilation of 1:10,000 maps of the Yellowknife Volcanic Belt in areas 85 J/8, 9 and 16.

S.A. Bowring* and W.A. Padgham collected samples for geochronological research in the Yellowknife Volcanic Belt.

W.A. Padgham continued detailed mapping of the Kam Group - Banting Group transition, and collected samples to investigate the geochemistry of the rocks in the transition zone.

J.A. Brophy completed detailed mapping of the Crestaurum Formation, northeast of the Yellowknife airport.

W.S. Fyfe* and R. Kerrich* (Univ. of Western Ontario), assisted by C. Ellis, began field work in the Western Granodiorite complex immediately west of the Yellowknife volcanic belt.

Elsewhere in the territories:

J.A. Brophy, with W.K. Fyson* (Carleton Univ.), began a study of the structural relations of gold-quartz veins in the Burwash Formation turbidites.

S. Swatton, under the direction of Dr. R.D. Morton* (Univ. of Alberta), worked on the Bullmoose Lake gold deposit in the Burwash Formation of the Yellowknife Basin.

V. Jackson and a large crew of summer students conducted 1:20,000 and 1:50,000 scale mapping in parts of the Quyta Lake area. This is the final field phase in the

preparation of new 1:50,000 scale geological maps of Yellowknife Bay (85 J/8), Prosperous Lake (85 J/9), and Quyta Lake (85 J/16) map sheets.

R. Cullen, directed by W.K. Fyson* (Ottawa Univ.), began a study of the Cameron River volcanic belt in the Gordon Lake area.

A.M. Goodwin* (Univ. of Toronto) continued geochemical investigations of the Yellowknife, Cameron River, and Back River volcanic complexes, and began work (with Division staff) on the geochemistry of the High Lake Volcanic Belt.

D. Kerr (Univ. of Ottawa) investigated the surficial geology of parts of the east half of the Hepburn Island area (76M) and continued research in the Richardson River area, northwest of Coppermine.

B. Johnston and Division summer staff, under the direction of J.A. Donaldson* (Carleton Univ.), continued stratigraphic and related work on the Wilson Island Group in the East Arm of Great Slave Lake.

Dr. K. St. Seymour* (Concordia Univ.) began work on the petrology and geochemistry of supracrustals in the Point Lake region of the Slave Province.

T. Kusky (SUNY & Johns Hopkins) began a project to analyse the mafic dyke/volcanic • successions in the Yellowknife Supracrustal Basin.

R.E. Meintzer and M. Wise, directed by Dr. P. Cerny* (Univ. of Manitoba), continued investigations of rare element pegmatites and granitoids in the Yellowknife Basin.

V. Jackson conducted 1:50,000 and 1:250,000 reconnaisance mapping in the east half of the Hepburn Island (76 M) area. An up-to-date 1:250,000 coloured geological map and report is in preparation.

L. de St. Jorre, under direction of D. Trueman (Highwood Resources) and D.G.W. Smith* (Univ. of Alberta), continued geochemical and mineralogical studies of the Thor Lake beryllium and rare earths deposit.

The products of these investigations will enhance the geological data base of the NWT, and will provide numerous maps and reports, including at least nine Masters and three Ph.D. theses on various aspects of the geology and mineral deposits of the NWT.

* contractor

1985 PUBLICATIONS

In 1985, the Mineral Industry Report for 1982 and 1983 was released (EGS 1985-4). Volume 2 of Contributions to the Geology of the Northwest Territories was released in early December. Mineral Industry Reports will now be prepared covering two year periods.

PUBLICATIONS:

Proposed mineral exploration activity, Keewatin, 1985; scale 1:1,000,000; P.J. Laporte. (EGS 1985-1).

Carte des dépôts meubles, secteur aval de la rivière Coppermine; scale 1:1,000,000; H.C. Bruneau. (EGS 1985-2).

Mineral exploration expected in the NWT, 1985; Geological staff, NAP Geology Division, Yellowknife, NWT. (EGS 1985-3).

Mineral Industry Report, 1982-83, Northwest Territories; J.A. Brophy, J.C. Crux, W.A. Gibbins, P.J. Laporte, C.C. Lord, W.A. Padgham, J.B. Seaton. (EGS 1985-4).

Geology of the Mistake Lake area, Anialik River Greenstone Belt, NWT; NTS 76M/11; scale 1:30,000; V.A. Jackson, J. Crux, C.E. Ellis, S. Howson, W.A. Padgham and C. Relf. (EGS 1985-5).

Geology of Nonacho Basin, NWT; parts of NTS 75 D/16, 75 E/1,2, 75 F/4,5,11,12,13,14 and 75 K/3,6,7; scale 1:10,000; L. B. Aspler, E.J. Hurdle, S. Barnes, R. Cockfield, S. Howson and B. Meissner. Supplemental map with D_1, D_3 and D_5 cleavages is available on request. (EGS 1985-7).

Geology of Keskarrah Bay area, NWT; parts of NTS 86 H/6,7; scale 1:31,680; V. Jackson. (EGS 1985-8).

Preliminary Geology of Ellington Lake area, NWT; part of 86 F/3; scale 1:30,000; K. Pelletier. (EGS 1985-9).

TALKS, PAPERS, AND ABSTRACTS PRESENTED IN CONFERENCES, OR OUTSIDE PUBLICATIONS

Brophy, J.A.: Gold Deposits of the NWT, a Review; Presentation to CIM Gold in the Western Shield Field Trip to the NWT, September, 1985.

Gibbins, W.A.: Carvingstone: a public lecture given March, 1985, to Ecology North at Prince of Wales Heritage Centre, Yellowknife.

_____: Soapstone deposits of the NWT; a public lecture given April, 1985, to The Inuit Art Enthusiasts (Edmonton) at the University of Alberta.

Gibbins, W.A., Boucher, D. and Skublak, W.: Fluorite from Princess Royal Islands - Historic and Possible Economic Significance, Arctic (in press).

Helmstaedt, H. and Padgham, W.A.: A new look at the stratigraphy of the Yellowknife Greenstone Belt - Implications on the age of gold-bearing shear zones and Archean

basin evolution; Paper presented at the Canadian Institute of Mining and Metallurgy, Geology Division Gold Symposium, Saskatoon, Sept., 1985.

Padgham, W.A.: Gold Deposits of the Northwest Territories: Classes, Styles, Genesis, Exploration Methods and Success Probabilities; Paper presented at the 12th Annual Geoscience Forum, Yellowknife, NWT, December, 1984.

_____ : Observations and speculations on supracrustal successions in the Slave Structural Province; in Evolution of Archean Supracrustal Sequences, L.D. Ayres, P.C. Thurston, K.D. Card, and W. Weber, eds.; Geological Association of Canada, Special Paper 28, 1985, p. 133-151.

_____ : Turbidite-Hosted Gold Deposits of the Northwest Territories (NWT); Program with Abstracts, v. 10.; GAC/MAC Joint Annual Meeting, Fredericton, 1985.

_____ : Geology and Metallogeny of Gold Deposits of the Western Part of the Precambrian Shield; Paper presented at the Canadian Institute of Mining and Metallurgy, Geology Division Gold Symposium, Saskatoon, Sept., 1985.

Padgham, W.A. and Brophy, J.A.: Gold Deposits of the Northwest Territories; Paper presented at the Canadian Institute of Mining and Metallurgy Annual Meeting, Vancouver, April, 1985.

MINERAL EXPLORATION, NWT, 1985

MINING DEVELOPMENTS

During the first half of the year most sectors of the NWT mining industry appeared to be performing well, although Cantung continued to operate at below capacity because of low prices and tight markets for tungsten. Low gold prices earlier in the year caused concern at some gold mines, and undoubtedly contributed to the early September shutdown of the Cullaton Lake Mine.

The sharp decline in zinc prices lead to a 10% cutback in production at Pine Point during the summer. Cuts of as much as 30% are expected for Pine Point and Polaris in the New Year, and thus prospects for the short term future of mineral production in the NWT are uncertain.

Development continued at Terra's Bullmoose gold deposits where an airstrip capable of handling DC-3 type craft was constructed, and plans for installation of a test mill are well advanced. Just to the south, Highwood Resources drove a decline to test the Thor Lake beryllium - rare earth deposits. Results are reported to be extremely favourable, and a production decision will probably be made in 1986.

Goldrich Resources Inc. began a decline on their TOM claims just south of Prosperous Lake; presumably to explore and develop veins similar to those on the Ptarmigan property 1200 m to the south-southeast.

By the end of 1985, $45 to 50 million will have been spent on various phases of mineral exploration in the Northwest Territories. (1984 expenditures exceeded $40 million, as reported to the Mineral Statistics group of EM&R). More than half of this will have been spent on gold exploration in the Slave Province. Another 10% represents gold exploration in the Keewatin. A significant amount will be spent on the Bullmoose gold and Thor Lake rare metal developments. Exploration at and around the nine mines that operated in the territory during the year was a major component of the mineral exploration effort.

PROPERTY ACQUISITION

Claim staking totalled 220,000 hectares by the end of December, and exceeded the average for the past three years. Over 90% of this was concentrated in the Slave Structural Province, where the main target is gold. Much of the rest was in the Keewatin, also presumably for gold, as it was mainly in the Archean Kaminak Volcanic Belt.

TABLE 1. PROSPECTING PERMITS ISSUED 1978 TO 1985 IN VARIOUS GEOLOGICAL PROVINCES

AREA	YEAR	78	77	78	79	80	81	82	83	84	85
ARCTIC ISLANDS		0	0	10	0	10	2	53	87	10	15
CORDILLERAN PROV.		1	0	5	1	11	9	12	7	0	0
CHURCHILL PROV.		53	25	50	72	57	54	17	1	10	11
BEAR PROVINCE		13	8	10	26	17	4	3	0	0	5
SLAVE PROVINCE		1	1	0	0	3	4	6	1	5	22
TOTALS		68	34	75	99	98	73	91	96	25	53

On the first of February, 1985, 53 new prospecting permits were issued; 28 more than in 1984. These new permits were distributed amongst 11 exploration groups and 50% of them were taken in areas of gold potential: 21 in the Slave and 2 in the Churchill Province. Only 36 permits lapsed, whereas last year (February, 1984), 44 lapsed. Table 1 compares prospecting permits issued in various geological regions in 1984 and 1985 with previous years' activity.

SUMMARY OF EXPLORATION

During 1984 at least 137 NWT mineral properties received some measure of exploration, which ranged in expenditure levels from millions of dollars on the massive Pine Point Mines holdings to

testing of the gold potential of creeks and mineral claims by individuals whose main expenditure was their own time. Table 2 lists these projects by geological area and compares the 1985 figures to those of years 1975 to 1984.

TABLE 2: COMPARISON OF ACTIVITY IN VARIOUS GEOLOGICAL PROVINCES AND SUBPRUVINCES

NUMBER OF PROPERTIES EXPLORED EACH YEAR

GEOLOGICAL REGION	YEAR	75	76	77	78	79	80	81	82	83	84	85
CORDILLERA		25	28	13	14	21	29	24	12	11	11	7
ARCTIC ISLANDS*		8	9	6	8	4	7	24	16	11	17	13
KEEWATIN		31	37	38	38	48	53	59	34	25	19	17
SE-MACKENZIE*		3	1	11	7	13	14	25	10	11	9	3
EAST ARM		10	7	2	7	6	4	14	3	1	1	2
PINE POINT		3	4	3	7	6	4	14	3	1	1	2
BEAR PROV.		18	27	35	32	32	22	24	10	11	2	3
SLAVE PROV.		44	44	28	29	33	29	42	25	44	57	92
TOTALS		142	163	136	140	162	164	218	113	116	117	139

*Includes Baffin Island and Melville Peninsula, part of the Churchill Province, as well as the Arctic Archipelago.
*Parts of the Churchill Structural Province.

The shift to gold, now the major target, continued and 95 projects tested gold properties: 80 in the Slave Province; 10 in the Keewatin; 1 in the Arctic Islands; and 4 in the Nahanni District.

Table 2 provides a summary of properties explored by geological region and Table 3 shows the properties according to commodity sought. Thirty-five of these projects included diamond drilling and three, underground development. Table 4 compares "high cost" projects in 1985 to those of previous years.

TABLE 3: EXPLORATION BY TARGET COMMODITY

COMMODITY	AGE OF MAIN HOST ROCKS (GEOLOGICAL PROVINCE)	YEAR 82	83	84	85
GOLD	ARCHEAN (SLAVE & KAMINAK SUBPROV) (placer in Nahanni)	25	53	77	95
URANIUM	PROTEROZOIC (BEAR & CHURCHILL)	36	25	16	8
SILVER	PROTEROZOIC (BEAR)	3	9	3	4
BASE METALS	ALL AGES	30	19	15	10
RARE METALS	ARCHEAN/PROTEROZOIC/CRETACEOUS (SLAVE - BEAR -NAHANNI (CURDILLERA)	15	7	3	15
COAL	CRETACEOUS/TERTIARY	2	1	1	0
MISCELLANEOUS		2	1	1	7
TOTALS		113	115	117	139

TABLE 4: HIGH COST PROJECTS (DRILLING, MINE DEVELOPMENT)

YEAR	75	76	77	78	79	80	81	82	83	84	85
DRILLING	47	41	40	52	61	81	58	45	54	29	35
MINE DEVELOPMENT	5	3	2	2	4	6	12	5	6	4	3
PRODUCING MINES	6	6	7	7	8	9	11	12	12	11	9
TOTALS	58	50	49	61	73	96	81	62	74	44	47

OPERATING MINES, 1985

J. A. Brophy, Staff Geologist
Northern Affairs Program Yellowknife

Ten mines (Fig. 1) operated in the NWT at the beginning of 1985. Low silver prices forced Terra to suspend production on April 1 and unprofitable operations resulted in the closing of the Shear Lake gold mine at the end of August. The net effect of these shutdowns on the productivity of the NWT mines is minimal, as these mines together accounted for only 1.5% of the total value of metal output in 1984.

OPERATING MINES, 1985
MINE OPERATOR (1985 WORKFORCE)
1 CON COMINCO (371)
2 GIANT GIANT YELLOWKNIFE MINES LTD (305)
3 SALMITA GIANT YELLOWKNIFE MINES LTD (110)
4 LUPIN ECHO BAY MINES LTD (288)
5 SHEAR LAKE ROYEX GOLD MINING CORP (7)
6 TERRA TERRA MINES LTD (75)
7 PINE POINT PINE POINT MINES LTD (650)
8 NANISIVIK NANISIVIK MINES LTD (204)
9 POLARIS COMINCO (271)
10 CANTUNG CANADA TUNGSTEN MINING CORP (205)
#3
#2
#4
#1

FIGURE 1: 1985 operating mines, NWT. Inset shows the name of the mine operator and the approximate 1985 workforce.

GOLD MINES

Cominco closed the Con Mine for three weeks in July to install new hoist ropes in the deepened Robertson Shaft, which now extends an additional 250 m to a depth of about 1900 m. This recently completed shaft-sinking project will open up another three levels to give access to at least 725 kt of ore grading about 13.7 g Au/t.

Giant Yellowknife Mines Ltd. did not process ore from its satellite mines (Lolor and Supercrest) this year because of low gold prices and high mining costs. Production was from Giant Mine and from the UBC zone northwest of the B-shaft. A decline to the UBC zone was completed and will give access to 16.3 kt of ore grading 19.2 g Au/t. A decline is also being driven to the GKP zone, about 1.5 km north of Supercrest, which contains about 38 kt of ore grading 12.6 g Au/t. Mining of this zone is expected to begin in 1986.

The Salmita Mine has been a solid performer for Giant Yellowknife Gold Mines.

TABLE 5
PRODUCTION, NWT OPERATING MINES, 1984-1985

MINE	COMMODITY	1984 MILLED	1984 PROD'N	JAN/85 RESERVES	1985* MILLED	1985* PROD'N
CON	Au (Ag) (As_2O_3)	221 kt	2770 kg Au 559 kg Au	1535 kt at 14.4 g Au/t	200 kt	2300 kg Au 490 kg Ag 1100 t As_2O_3
GIANT	Au (Ag) (As_2O_3)	295 kt	1993 kg Au 262 kg Ag	959 kt at 8.2 g Au/t	305 kt	1950 kg Au 510 kg Ag 1600 t As_2O_3
SALMITA	Au (Ag)	55 kt	1382 kg Au 341 kg Ag	80 kt at 29.1 g Au/t	65 kt	1970 kg Au 330 kg Ag
LUPIN	Au (Ag)	492 kt	5646 kg Au 820 kg Ag	3142 kt at 12.19 g Au/t	560 kt	6000 kg Au 900 kg Ag
B-ZONE	Au (Ag)	*52 kt	*450 kg Ag 41 kg Ag	unknown	nil	nil
SHEAR LK	Au (Ag)	*87 kt	*423 kg Au 27 kg Ag	unknown	80 kt	400 kg Au 30 kg Ag
TERRA	Ag	20 kt	25 t Ag	unknown	6 kt	6.7 t Ag
PINE POINT	Zn, Pb	2279 kt	161 kt Zn 46 kt Pb	21,772 kt at 6.0% Zn 2.7% Pb	2160 kt	170 kt Zn 63 kt Pb
**NANISIVIK	Zn,Pb (Ag)	692 kt	67 kt Zn 6 kt Pb 27 t Ag	3150 kt at 9.5% Zn 0.5% Pb	692 kt	61 kt Zn 5 kt Pb 23 t Ag
POLARIS	Zn, Pb	819 kt	107 kt Zn 28 kt Pb	19,958 kt at 14.3% Zn 3.8% Pb	925 kt	116 kt Zn 30 kt Pb
CANTUNG	WO_3	307 kt	3.50 kt WO_3	2540 kt at 1.39% WO_3	340 kt	3.7 kt WO_3

*Data from the Mining Inspection Service of the Gov't of the Northwest Territories based on figures submitted to them monthly by the mines. 1985 figures were extrapolated to year-end from data available to the end of November, 1985.

**1984 data for Nanisivik is based on their fiscal year: April 1, 1984 to March 31, 1985.

All data not otherwise indicated is taken from company annual reports.

TABLE 6
MINE OUTPUT BY COMMODITY
1983, 1984 and 1985*

	GOLD (kg)	SILVER (kg)	ZINC (kt)	LEAD (kt)	TUNGSTEN (kt)	VALUE ($x10^6)
1983	9,246	73,119	246.3	64.2	0.35	$514
1984	12,670	53,727	341.6	87.5	3.53	$800
1985	12,620	31,960	347.0	98.0	3.70	~$800

*Data extrapolated to year-end from information available to the end of November, 1985.

In 1985 it produced more gold than Giant's Yellowknife-based mines (Table 5), and this from about 80% less tonnage. Mining is currently in progress on the sixth (295 m) level, and the decline is being deepened to develop ore to the seventh (350 m) level. Additional drill-indicated reserves between the eighth and tenth levels (400 m to 500 m) will be mined using a winze sunk from the sixth level.

The Lupin Mine of Echo Bay Mines Ltd. was the most productive of the NWT's gold mines this year, more than doubling the output of its closest rival, Con Mine (Table 5). Additional reserves are being outlined in the L-19 zone, an extension of the host iron-formation unit to the east of the East zone. A shaft-sinking project, begun in January, 1985 and scheduled for completion in early 1987, will deepen the shaft from 370 m to 790 m.

ZINC-LEAD MINES

The three zinc-lead mines, Pine Point, Polaris and Nanisivik, are being adversely affected by declining prices and markets for zinc. Cominco has announced that next year it will reduce the amount of zinc and lead concentrates produced at Polaris by 22.7 kt and 3.6 kt respectively. At Pine Point Mines, concentrate production was reduced by 11% for the second half of 1985. Full-scale mining of the highest-grade ore is planned in 1986/1987 in an effort to make the operation profitable. This may result in the closure of Pine Point in late 1987.

TUNGSTEN

Operations at Canada Tungsten's Cantung Mine were routine in 1985.

PRODUCTION SYNOPSIS

Production synopses for 1984 and 1985 are shown in Tables 5 and 6. In 1985, output of the four main commodities (gold, zinc, lead and tungsten) were similar or slightly higher than that of the previous year. Silver production, however, declined by about 40%. With slightly lower prices expected on average for gold, lead and zinc compared to 1984, it is anticipated that the value of mineral production in the NWT in 1985 will be $800 million, about the same as last year.

MINERAL EXPLORATION OVERVIEW NAHANNI DISTRICT, 1985

C.C. Lord, District Geologist
Northern Affairs Program, Yellowknife

Most of the mineral exploration in the Nahanni in 1985 was for placer gold. Figure 2 shows the locations of the properties explored.

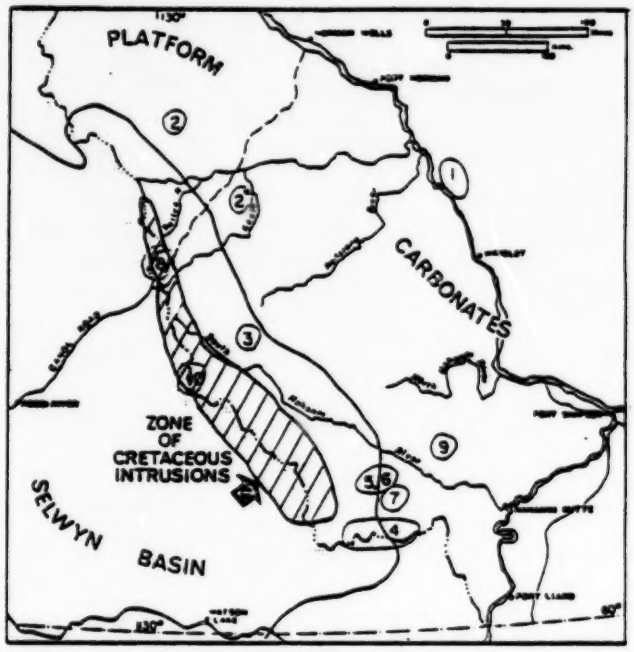


FIGURE 2: Exploration in the Nahanni District, 1985.

GOLD

Prospector E. Linberg searched for gold and tungsten around the headwaters of the Brokenshell River (3).

Prospectors M. and P. Jones examined the country between Spruce and Jack Pine Lakes for its placer gold potential. No gold was found (4).

E. Barnes operated a small sluice box along Borden and Bennett Creeks for placer gold (5). Several small nuggets were found. The granite intrusion, south of this camp, was prospected (6).

L. Schamanek prospected for gold around Clarke and MacMillan Lakes (7).

TUNGSTEN

Amax gathered more data for a feasibility study of their deposit at MacTung (8).

No surface exploration was done on Canada Tungsten's mine property at Tungsten, NWT (10).

MISCELLANEOUS

Selco Inc. did heavy mineral stream sampling along the Mackenzie Valley (1) and examined several diatremes (2) (carbonatites) in the mountains for their diamond-bearing potential.

Asamera Oil inspected the surface and underground workings at Cadillac's lead, zinc, silver mine on Prairie Creek (9).

MINERAL EXPLORATION OVERVIEW ARCTIC ISLANDS REGION 1985

W.A. Gibbins, District Geologist
Northern Affairs Program, Yellowknife

Exploration projects conducted in the Arctic Islands in 1985 are shown in Figure 3.

BASE METALS

Panarctic Oil Ltd's minerals group prospected and mapped prospecting permits that cover much of the Minto Arch of Victoria Island (1). Several holes were drilled to test the copper-silver potential of selected target areas.

Drilling by Cominco Ltd. continued to define the limits of the Polaris deposit of southwestern Little Cornwallis Island (2). Similar drilling in 1984 increased the total measured and indicated reserves of ore by 18 percent (3.1 million tonnes).

Nanisivik Mines Ltd. conducted a major exploration program, consisting mainly of drill-testing the economic potential and mineability of satellite sulphide zones on Nanisivik mineral leases (3). Geophysical surveys (mainly TURAM EM) of claims staked in 1984 west of the Nanisivik Mine, outlined conductive zones similar to those that lead to the discovery of massive pyrite deposits on the OEB claim in 1984. Several university-based research projects dealing with fluid inclusions, sulphur isotopes geochemistry and ore genesis are in progress.

PetroCanada Ltd. drill-tested a fault-controlled silver-barite-galena showing in Adams Sound Formation quartzites at Elwin Inlet, Northern Baffin Island (4). They also completed a reconnaissance soil geochemistry survey of an area of western South-Central Baffin Island (5).

PRECIOUS METALS

Late in the field season, Borealis Exploration Ltd. had a small crew working on their Melville Peninsula permits (6). Gold was the principal target sought.

OTHER

Arctic Islands District Geologist, Walter Gibbins, and Dr. Don Hogarth (Univ. of Ottawa), examined mica (8,10) andcarvingstone deposits (9,10) of Southern Baffin Island.

The GNWT Dept. of Economic Development introduced a new quarrying

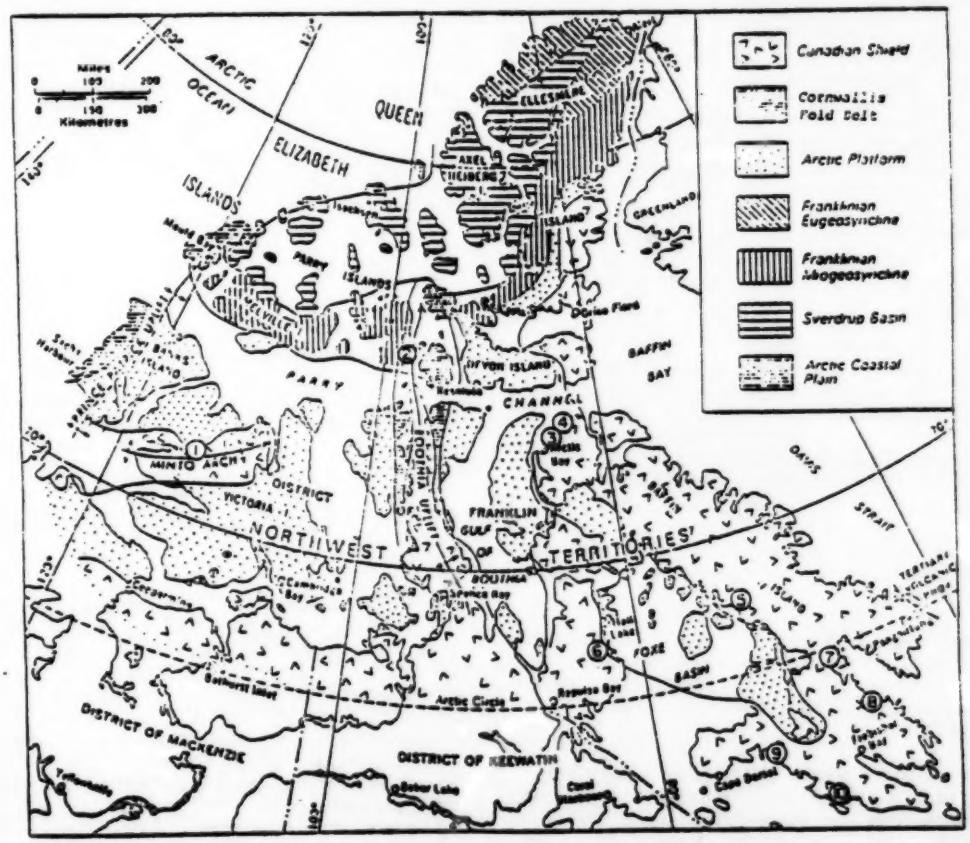


FIGURE 3: Mineral exploration in the Arctic Islands, 1985.

techniques, using non-explosive demolition agents, at the Clearwater Fiord Carvingstone site, near the head of Cumberland Sound (7).

MINERAL EXPLORATION OVERVIEW KEEWATIN DISTRICT, 1985

P.J. Laporte, District Geologist
Northern Affairs Program, Yellowknife

1985 exploration projects are shown in Figure 4.

PRECIOUS METALS

A four- to six-man crew explored Canadian Nickel Company Ltd.'s prospecting permits north and west of Whale Cove (1). The crew operated out of Whale Cove in May and did geophysical surveys on a gold showing northwest of the airstrip. In July and August, they prospected their newly acquired permit at the mouth of the Wilson River and did detailed geological and geophysical surveys on showings discovered last year.

Borealis Exploration Ltd. acquired a prospecting permit southwest of the Ferguson River (2). A three- to six-person crew prospected and sampled a gold showing on the southern edge of the prospecting permit from mid June to early September. The showing, discovered and trenched by Hudson Bay Mining and Smelting in the late 1940's, consists of quartz-chalcopyrite-gold veins in sheared andesite intruded by diorite. Reconnaissance magnetometer and Max-Min EM surveys were also done. In late December, VLF-EM, magnetometer and HL-EM surveys and diamond drilling were undertaken. Plans call for 1000 m of shallow drilling to be completed by February, 1986.

From May to late August, Suncor Inc. operated two five- to ten-person diamond drilling camps in the Cullaton Lake area. The crew at the Lothrop Lake camp, south of Otter Lake (3), explored two gold showings drilled by Selco Exploration Ltd. in 1966 and 1967, with geological and geophysical surveys and diamond drilling. The crew at Mountain Lake (4) resumed the drilling, started in 1983, of geophysical anomalies in iron formation and conducted ground geophysical surveys.

Royex Mining Ltd. did not undertake any exploration on Cullaton Lake Gold Mines Ltd.'s property (5) and the operation was put on a care-and-maintenance basis in early September.

Between June and August, Aberford Resources Ltd. had a five-person crew prospect and map their five newly acquired permits south of Yathkyed Lake (6) in search of lateral extensions to the gold-bearing sulphide zones detected last year.

A two-person crew from Echo Bay Mines Ltd. occupied the old Urangesellschaft Canada Ltd. camp at Long Lake (7) for two weeks and investigated the gold potential of the Baker Lake area.

Comaplex Resources International Ltd. sent a four-man crew to map, prospect and do limited geophysical surveys on their claims east of Judge Sissons Lake (8) in June and July. The crew also prospected a newly acquired prospecting permit north of Whitehills Lake (11) before moving north to map and prospect claims and a prospecting permit northwest of Tehek Lake (12).

URANIUM

Urangesellschaft Canada Ltd. had thirty to thirty-five persons occupying three camps within five miles of the Lone Gull Deposit (9) from May to September. Detailed geological, geophysical and geochemical surveys were used to explore areas of favourable lithology. Three anomalous areas and two new showings discovered in 1984 were drilled. Deep holes were drilled on the Lone Gull Deposit to determine the down-dip extent of the mineralization and resolve geological problems. A pre-feasibility transportation study was also undertaken.

A ten- to twelve-person crew from PNC Explorations (Canada) Ltd. and consultants explored their claims in the Marjorie Lake area (10). Geological, geophysical, geochemical and boulder-tracing studies were completed on two grids in July and August. A number of dormant and active properties in the Baker lake area were visited and are being considered for acquisition.

MINERAL EXPLORATION OVERVIEW SOUTHEAST MACKENZIE DISTRICT, 1985

W.A. Gibbins, District Geologist
Northern Affairs Program, Yellowknife

Exploration in the Southeast Mackenzie District is shown in Figure 5.

URANIUM

PNC Exploration (Canada) Ltd. drilled 15 holes on the DVB claims near "Dunkel Lake" (1), on the east side of the Dubawnt Basin. A winter geophysical program (gradiometer, Max-Min, EM-16 and Crone DEEP-EM) on Permits 1071 and 1072 (2), on the west side of Dunkel Lake, near Eyeberry Lake, was followed by INPUT and reconnaissance lake sediment surveys during the summer. In May and June, 1985, PNC Exploration (Canada) Ltd. drilled uranium targets near the Nonacho Group - basement unconformity between Salkeld Lake and southern Hjalmar Lake (3).

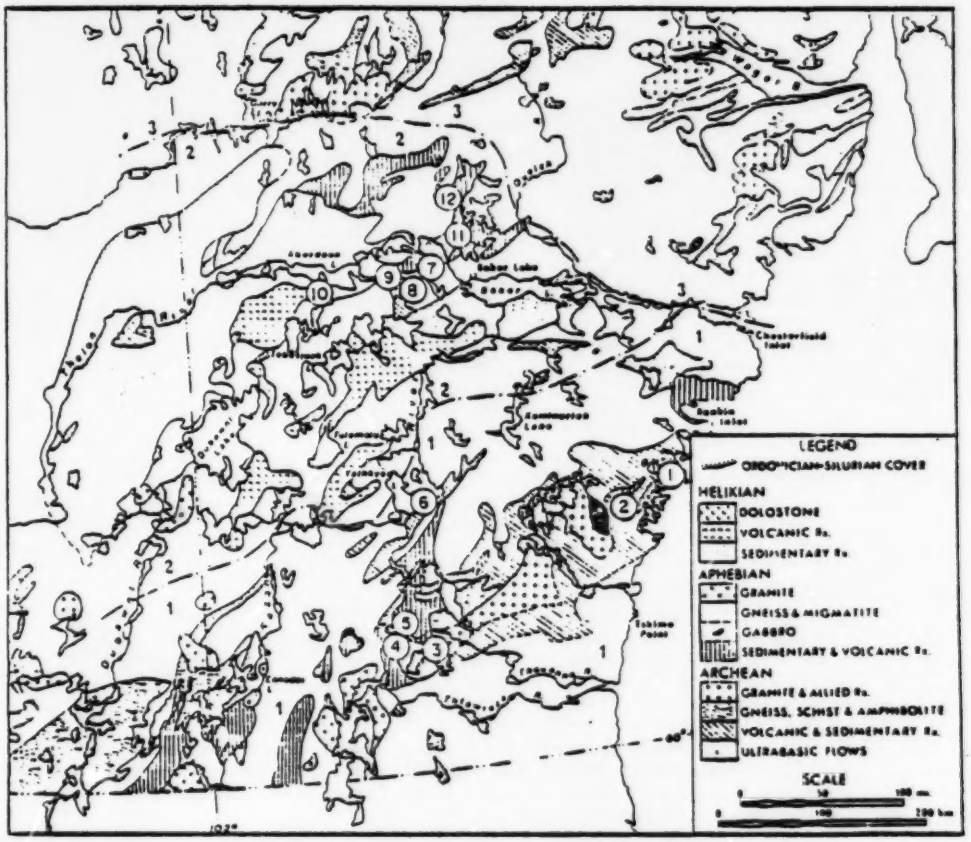


FIGURE 4: Mineral exploration in the Keewatin District, 1985.

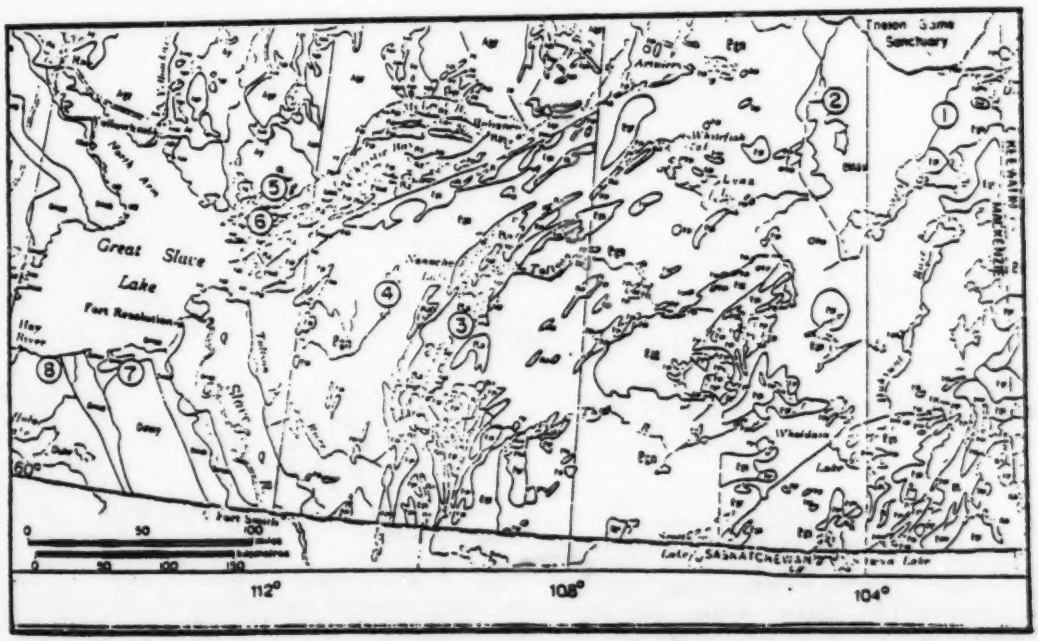


FIGURE 5: Mineral exploration, Southeast Mackenzie District, 1985. Geology from GSC map 30-1963.

BASE METALS

Pine Point Mines Ltd. continued to explore their mining leases (7), largely by IP surveys and follow-up grid drilling. Exploration during the first half of the year added minor new ore to the reserves. Late 1985 exploration work defined the new P-24 deposit with reserves of half a million tons. An additional 1.5 million tons of ore was also found in other deposits. Pine Point Mines Ltd. also completed another three drill holes on the JMBS claims west of the Buffalo River (8).

Enexco International Ltd. plan geophysical surveys over their nickel-copper prospects at Rutledge Lake (4) this fall.

Highwood Resources Ltd. staked cobalt-nickel arsenide deposits on Blanchet Island (6).

OTHER

Highwood Resources Ltd. began a major feasibility study of their Thor Lake beryllium, yttrium, rare-earth, columbium, tantatalum deposits in the Blatchford Lake Plutonic Complex (5). A 500 m-long decline was driven to more than 80 m depth in the Be-Y-REE-rich north T-zone, primarily to provide a bulk sample of the various sub-zones for metallurgical testing, but also to verify and compare assay and beryllometer results with drill results. Detailed mineralogical studies have shown that more than eighty mineral species are present. The R-zone was tested with new trenches and beryllometer surveys and all of the Cb-Ta rich, Lake-zone core was re-logged. Additional diamond drilling in the north T-zone and Lake zone was started in September.

MINERAL EXPLORATION OVERVIEW BEAR AND SLAVE STRUCTURAL PROVINCES, 1985

J.B. Seaton, District Geologist
J.C. Crux, A/Archives Geologist
Northern Affairs Program, Yellowknife

Most of the exploration in the Slave Province was for gold. Little was done in the Bear Province. For locations of properties explored, refer to Figures 6a and 6b.

GOLD

Corolla Resources Ltd. completed soil and rock geochemistry surveys, geological mapping and a detailed VLF-EM survey over their STORM, PAN and CALM claims in the Consolation Lake area (3,4). Samples were analyzed for gold and tungsten.

Terra Mines Ltd's 1985 program at Bullmoose Lake (3) included underground development, surface and underground diamond drilling, construction of a pilot mill, geological mapping and a small amount of geophysical surveying. The airstrip to the north of the mine area was extended to a length adequate for DC-3 aircraft.

Asamera Inc. reconnoitred with a 2- to 4-person crew and completed staking in several areas: Clan Lake (4); Sunset-Amacher Lakes (4); Yellowknife area (7); and Indian Mountain Lake (11).

Noranda Exploration Co. Ltd. performed geological reconnaissance and prospecting over several claim blocks in the Beaulieu River (Turnback, Tumpline, Detour and Victory Lakes areas)(4,5). A small amount of additional staking was completed.

In the Clan Lake area (4), north of Yellowknife, Noranda prospected and did reconnaissance and detailed (1:1000) mapping, sampling, and outcrop stripping on the BOSS claims.

Noranda staked and prospected in the Russell Lake-Siemon Lake area (9). Most of the work was done near Siemon Lake, where the LEMON and LEMONAID claims and newly staked claims were explored.

In the Indian Mountain Lake area (11) a small amount of prospecting and staking was also done by Noranda.

In the Matthews Lake-Courageous Lake area (12)(BERTHA and FAT claims), Noranda re-logged core, prospected and stripped outcrop. An orientation down-hole resistivity survey was completed as well. Magnetometer and VLF-EM surveys were also conducted over a grid covering the CAROL 1 and 2 claims and parts of the FAT, STOUT and TALL claim blocks.

In the Chalco Lake (near Indin Lake) area (14), Noranda mapped, prospected and carried out geophysical surveys at 1:10,000 scale on their STEAL claim and the adjoining BAT claims optioned from Petromet Resources Ltd. Some outcrop stripping was done to check geological interpretation. Noranda also mapped and conducted lithogeochemical surveys on the BETAM and BRINK claims between Indin and Damoti Lakes (14).

In the Point Lake-Itchen Lake area (16,17), Noranda staked and prospected the KES claims (west of Keskarrah Bay), the KAR (between the northeast and southeast arms of Point Lake), and the MAX claims (at Itchen Lake). Reconnaissance geological mapping was at 1:31,680.

Blackridge Gold Ltd. performed detailed geological mapping around a small gold deposit at the south end of Gordon Lake on the MQ 1 claim (5) and smaller scale mapping over a wider surrounding area (AUR, JAL, MCC claims), as well as magnetometer and VLF-EM surveys.

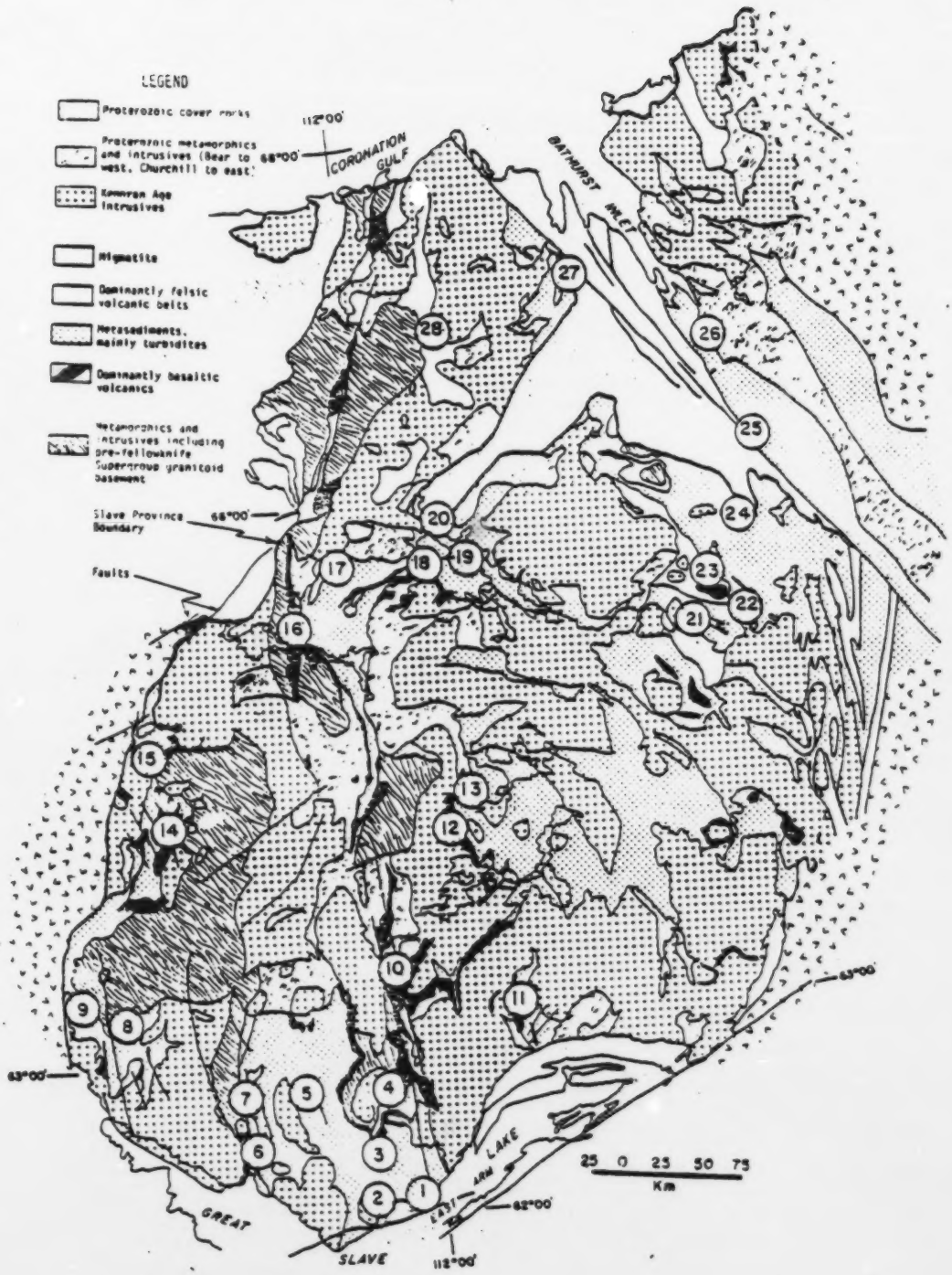
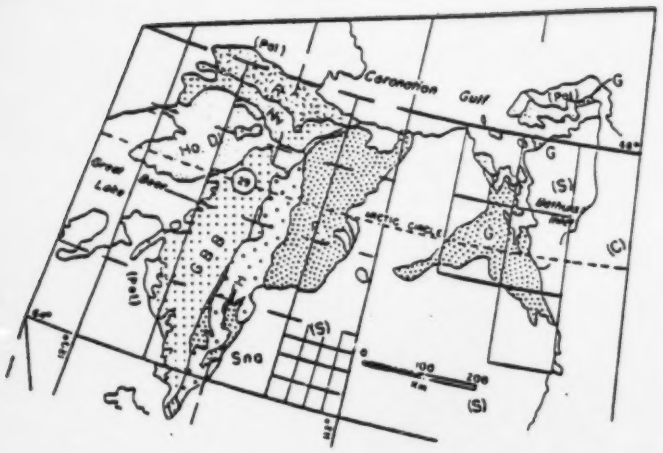


FIGURE 6a: Mineral exploration, 1985, Slave Province.


Coronation
Gulf
Great
Bear
Lake
Arctic Circle
Sno
(S)
(C)
(Pol)
(Pol)
(Pol

On Echo Bay Mines Ltd.'s claims at Lex Lake (in the Indin Lake Supracrustal Belt), work during 1985 included drilling with emphasis on "ore" definition. The Main zone was geologically mapped at 1:500 and a wider area of the KIM 5 and 6 claims was mapped at 1:2500. A small amount of magnetometer and VLF-EM surveying was done to conclude last winter's geophysical program. A thesis project was undertaken to study the structural geology around the KIM claims gold deposit.

A helicopter-borne EM, magnetometer and VLF survey was flown over claims in the Itchen-Contwoyto Lakes area (17). As well, regional and detailed mapping, geophysics, trenching and drilling were carried out on the RUSH, CUB, and F claims (17).

Around Bathurst Inlet, detailed mapping and geophysics were carried out over the HEN claims, and drilling on the HUNT claims (26). Echo Bay also reconnoitred and did minor trenching on their other claims and permits in the area (25,26).

In the Indin Lake Gold Belt (14), Frontier Gold Mines Ltd. undertook a preliminary examination of their SANDRA claim and examined and sampled old showings on their CATHY claim.

Golden Rule Resources Ltd. flew a DIGHEM survey over their claims in the Indin Lake area (14).

Placer Development Ltd. explored several claims in or near the Courageous Lake Volcanic Belt (12,13). These claims include Placer's COU, AL, MIST and FOG claims and the COL and DEC claims optioned from Colray Resources Ltd. In the Indin Lake area (14), Placer reconnoitred the large OTI and SPAN claim blocks. The OTI claims are at Damoti Lake and the SPAN claims are near Fortune and Spanner Lakes, and south of Spider Lake. Several gold showings were covered by grids which were explored by magnetometer and VLF-EM surveys.

Suncor Inc., in joint venture with Treasure Island Resources Ltd., explored claims in the Spider Lake area (15) by a 700 line-km DIGHEM airborne EM and magnetometer survey. They explored a grid on Treasure Island (in Spider Lake) by 1:1000 scale geological mapping, magnetometer and VLF-EM surveys and excavated two trenches in the northern part of Treasure Island. In the nearby Laurie Lake area (14), they explored the LONG and PEGLEG 1 claims by 1:1000 scale geological mapping, rock sampling and VLF-EM and magnetometer surveys on three grids. Suncor also explored claims in the Arseno Lake area (15) by prospecting.

Bow Valley Industries Ltd. flew an airborne INPUT EM and magnetometer survey over their claims in the Contwoyto Lake area (18-20). Numerous grids were set up and geological mapping, geophysics (VLF, magnetometer, Max-min) and drilling carried out. Claims held by Bow Valley include the AU claims (various options from Hemisphere Development Corp. Viscount Resources Ltd., Aber Resources Ltd., Great Bear Development Corp.), OP claims (OP Resources Ltd.), and the FIN and BARB claims (Aber Resources Ltd.).

Brinco Ltd. drilled EM conductors on the WEST claims (18,20) that were acquired from Consort Energy Ltd. and Roxwell Gold Mines Ltd. The property is close to Lupin Mine.

Hecla Mining Company Ltd. flew an EM and magnetometer survey over the JOHN, SHIN, and DLER claims (18,20) at and northeast of Contwoyto Lake. This large block of claims was acquired from 305314 Alberta Ltd.

Argonaut Resources Ltd. flew an input (AEM and total field magnetic) survey over their WHY claim block (20) near Lupin Mine.

Hidden Lake Gold Mines Ltd. flew a DIGHEM AEM and magnetometer survey over their GOLD claim in the Contwoyto Lake region (20).

Back River Joint Venture drilled targets on Prospecting Permit 973 near "George Lake" (24) and did prospecting, mapping and locally more detailed surveys on their main block of 15 prospecting permits which adjoins Permit 973 to the southeast and northwest. A separate block of two prospecting permits at Malley Rapids (22) was reconnoitred and prospected.

Silver Hart Mines Ltd. explored the FARN and KNUT claims near Pistol Lake (27) by agreement with Gold Fields Mining Corporation, together with adjoining Silver Hart-owned claims by geological mapping and diamond drilling.

LITHIUM

Erex International Ltd. trenched on their BET 1-2 claims on Drever Lake to the northeast of Blatchford Lake (1).

Equinox Resources Ltd. completed boundary surveys of several lithium properties in the Yellowknife Supracrustal basin (5-7). These properties which are scattered over a fairly wide area were explored by Canadian Superior Exploration Ltd., which made tonnage estimates for the various deposits. The properties were acquired successively by Erex International Ltd. and Equinox.

TANTALUM, TIN

J.S. Vincent carried out trenching on his BIN, LENS, MUT (2) and HID (3) claims in the Mystery Lake area.

A lithogeochemical study, started in

1982/1983, continued in 1984/1985 on Tantalum Mining Corp. of Canada's TCS and COVE claims in the Thompson Lake area (5).

URANIUM

CEGB Exploration (Canada) Ltd. explored their permits in the Great Bear Lake - Dumas Lake areas (29) by reconnaissance and detailed geological mapping, prospecting and soil sampling. This was the only reported work carried out in 1985 in the Bear Province.

13th Annual Geoscience Forum
Yellowknife, NWT; December 3 - 5, 1985

STRATIGRAPHIC RELATIONS IN THE UPPER PART OF THE YELLOWKNIFE BELT

Gorden Bailey
Department of Geological Sciences
Queen's University

In the Yellowknife volcanic belt, rocks assigned to the Banting Formation of the Archean Yellowknife Supergroup (Henderson, 1970) are in three northerly trending belts and on several islands in Yellowknife Bay. The two northern belts were assumed by Henderson (1970) to be on opposing limbs of a major syncline: the western limb underlain by sandstones and conglomerates of the Jackson Lake Formation; the eastern limb underlain by turbidites of the Burwash Formation, and the core occupied by turbidites of the Walsh Formation. Detailed mapping by Helmstaedt and others (1980) and Easton and Jackson (1981) showed conformable easterly younging contacts from the Walsh Formation into the eastern belt of Banting Formation and into the Burwash Formation indicating that the Burwash Formation is the youngest of the three. Henderson (1970) showed that the Jackson Lake Formation is always in fault contact with the Banting Formation. Helmstaedt and others (1980) suggested a transitional contact between these two formations.

Re-examination of contact relationships confirmed the generally east-facing conformable relationship between the Walsh and Banting Formations, and the Banting and Burwash Formations. A transitional contact between the Banting and Jackson Lake Formation could not be confirmed at the locality in question. The two formations are separated by a 30 cm covered interval presumed to be a fault contact. The Jackson Lake Formation is probably younger than the Banting and Walsh Formations because it is always in fault contact with the Banting Formation; it is not intruded by felsic porphyritic dikes or mafic sills and dikes present in the Banting and Walsh Formations, and it has a provenance dominated by silicic volcanic material (Henderson, 1975) suggestive of erosion of Banting strata.

The eastern younging relationship is reflected in Helmstaedt and Padgham's (in press) stratigraphic nomenclature, where the "Banting Group" includes: the western belt (Ingraham Formation) consisting of the Greyling Member in the north and the fault-displaced Shot Member in the south, and the eastern belt as the Prosperous Formation. The Walsh Formation of the Duncan Lake Group (Henderson, 1970) is a sedimentary intercalation between the Greyling member and the Prosperous Formation. The Jackson Lake Formation is presumed to be younger than all of the above.

The Banting Group is usually referred to as a felsic volcanic pile, but includes more intermediate and mafic rocks than previously considered. Measured sections through the Ingraham and Prosperous Formations show that rock types within the group are variable along and across strike and include mainly intermediate to felsic fragmental flows, pillowed and massive mafic flows, felsic to intermediate bedded and welded tuff, and associated volcaniclastic sediments. A unit of relatively homogenous quartz-feldspar porphyry near the base of the Ingraham Formation, mapped as intrusive rocks by Easton and Jackson (1981), has extrusive textures and is re-interpreted as consisting of fragmental deposits. Intruding the Banting Group are light coloured porphyritic dikes that decrease in abundance stratigraphically upwards, mafic sills and irregular bodies displaying relict gabbroic texture, and younger diabase dikes. The porphyritic dikes are petrographically similar to dikes intruding the mafic flows of the Kam Group (Helmstaedt and Padgham, in press) and many porphyritic rocks within the Banting Group. These dikes may represent a subvolcanic conduit system to felsic and intermediate volcanics of the Banting Group, whereas the mafic rocks of the Banting Group may be the product of late Kam Group volcanism.

REFERENCES

Easton, R.M. and Jackson, V., 1981:
Geology of the Walsh Lake area, NTS 85 J/9; Indian and Northern Affairs Canada, EGS 1981-3.

Helmstaedt, H., King, J.E. and Boodle, R., 1980:
Geology of the Banting and Walsh Lakes map-areas, NTS 85 J/9; Indian and Northern Affairs Canada, EGS 1980-5.

Helmstaedt, H. and Padgham W.A., in press:
A new look at the stratigraphy of the Yellowknife Supergroup at Yellowknife, NWT - implications for the age of gold-bearing shear zones and Archean basin evolution; Canadian Journal of Earth Sciences.

Henderson, J.B., 1970:
Stratigraphy of the Archean Yellowknife Supergroup, Yellowknife Bay-Prosperous Lake area, District of Mackenzie; Geological Survey of Canada, Paper 70-26, 12 p.

_____, 1975:
Sedimentology of the Archean Yellowknife Supergroup at Yellowknife, District of Mackenzie; Geological Survey of Canada, Bulletin 246, 62 p.

THE GEOLOGY OF THE EARLY PROTEROZOIC BELL ISLAND GROUP, DISTRICT OF MACKENZIE

John Blenkinsop, Ingrid Reichenbach
Department of Geology
Carleton University

A mapping project of the oldest supracrustal rocks of the Great Bear Magmatic Zone in western Wopmay Orogen is now complete. Detailed mapping was done at 1:16,000 scale and the data compiled at 1:25,000 scale. These supracrustal rocks are part of the McTavish Supergroup and have informally been referred to as the Bell Island Group, after exposures on Bell Island in Hottah Lake. They have received no detailed study in the past, although they are of potential regional and volcanological significance. The succession of rocks studied unconformably overlies an older sialic basement complex (Hottah Terrane) and is unconformably overlain by the calc-alkaline LaBine Group in the Conjuror Bay area. The rocks are broadly folded about gently plunging, northwest-trending axes and cut by transcurrent faults. Prevalent brittle faults with both easterly and northerly trends are, for the most part, compatible with the same stress regime as the transcurrent faults.

The lower part of the Bell Island Group comprises 1.5-2 km of poorly sorted arkose and fanglomerate, aphyric to sparsely porphyritic mafic to intermediate lavas, block-and-ash flows, a mineralogically zoned cooling unit of rhyolite ash-flow tuff, and aphyric to porphyritic rhyolite flows and domes. Structures and lithologies of the sedimentary rocks, as well as physical characteristics of the volcanics, suggest subaerial deposition. Chemical analyses of lavas and ash-flow tuff indicate a predominately calc-alkaline suite. Conformably overlying the lower subaerial succession is at least 3.5 km of tholeiitic pillow basalts, intercalated sedimentary rocks and breccias, and tholeiitic gabbro sills. Locally, both pillow basalts and gabbro sills are plagioclase glomero-porphyritic and likely comagmatic.

The subaerial to subaqueous transition in rocks of the Bell Island Group suggests 2-3.5 km of syn-volcanic subsidence which may have begun during early subaerial volcanism. If so, it continued during the extrusion of the thick tholeiitic pillow-basalt pile. Subaerial conditions resumed during eruption and deposition of the overlying calc-alkaline LaBine Group. Therefore, rocks of the Bell Island Group may represent initiation of calc-alkaline magmatism in a continental arc, followed by tholeiitic magmatism related to intra-arc extension.

Due to the two distinct successions of rocks in the Bell Island Group, formal stratigraphic names will be suggested that better reflect this.

GOLD DEPOSITS OF THE NORTHWEST TERRITORIES AN OVERVIEW

J.A. Brophy, A/Nahanni District Geologist
Northern Affairs Program, Yellowknife

About 85% of the 350 t of gold produced by twenty-five mines in the Northwest Territories (NWT) since 1935 has come from the Yellowknife-area mines, Con and Giant, which exploit shear zones in Archean mafic volcanics of the Slave Structural Province. Four percent of the total production has been from Archean iron formation-hosted deposits, mainly from Lupin Mine, which today produces more gold than Con and Giant combined and has been primarily responsible for the increase of NWT gold output from five to twelve tonnes per year since 1981. The remaining gold has been won from the following deposit types, all but the latter being in Archean rocks: sedimentary-volcanic contact deposits such as Discovery and Salmita (10%); turbidite-hosted quartz-vein deposits such as Camlaren and Ptarmigan (1%); Proterozoic deposits such as Shear Lake and Fox (<<1%).

All but 1% of NWT gold has come from the Archean Slave Structural Province, which is also the premiere exploration area for gold deposit types that have yet to be productive in the NWT. These types include stratabound gold in mafic and in felsic volcanic rocks (eg., Indin Lake and Courageous Lake respectively), as well as gold in plutonic rocks (eg. Anialik Gneiss Complex). There is also potential for gold in other Archean terranes, mainly in the Rankin-Ennadai Volcanic Belt, but also in the Cordillera for placer gold and gold associated with Cretaceous plutons.

PROGRESS REPORT ON INVESTIGATIONS OF AURIFEROUS QUARTZ VEINS IN ARCHEAN TURBIDITES OF THE YELLOWKNIFE SUPRACRUSTAL BASIN

John A. Brophy, Staff Geologist
Northern Affairs Program, Yellowknife

INTRODUCTION

The main purpose of this investigation is to establish geological parameters that can be used by explorationists to help them evaluate the gold potential associated with quartz veins in turbidites of the Yellowknife Supracrustal Basin. Sixteen mines have exploited gold-bearing quartz-vein deposits in the basin since 1935 , but few of these have been profitable, and altogether they have contributed only 1% of the NWT's total gold production. Most of these mines operated when the price of gold was less than $40.00 per ounce. In addition, there are more than one hundred auriferous quartz-vein showings in the basin, most of which were found prior to 1960. With new

technologies for gold recovery, improved infrastructure, higher gold prices and modern mining techniques, there has been a revival of interest in these deposits. This is evident from recent encouraging developments at Bullmoose and Gordon Lake.

Traditionally, the principal exploration strategy at the reconnaissance level has been to evaluate gold potential by sampling and assaying quartz veins. However, because of the notoriously patchy distribution of gold in these quartz veins (nugget effect), this method can be costly and the results misleading. Moreover, many quartz veins occur in swarms confined to low-weathering argillite units that are poorly exposed and impossible to sample adequately without substantial excavating or drilling.

My research, therefore, is to establish whether or not there are geochemical, petrological, lithological or structural signatures in the country rocks that can be used during reconnaissance to focus exploration in areas having the highest potential for hosting an economically viable deposit. Ancillary objectives of this investigation are to elucidate the relationships between quartz veining, gold mineralization, and the complex deformational history of the basin. This study is being confined mainly to greenschist-grade rocks because they are structurally and petrologically more simple to interpret than their amphibolite-grade counterparts.

1985 FIELDWORK

Fieldwork in 1985 was mainly for the purpose of orientation. About fifteen days were spent visiting the following gold properties: Giant Bay, Blackridge, No. 31 Vein, Camlaren, Ruth, Ptarmigan, Burwash, and Bullmoose. In addition, several quartz-veined zones were visited where gold has not been reported. Samples of quartz veins and their footwall and hangingwall rocks were collected at most of the properties visited. Samples of greywacke and argillite from the general vicinity of the quartz veins were also collected. More than one hundred samples were collected and analyzed for gold by Chemex Laboratories in Calgary using an atomic absorption fire-assay technique with a 5 parts per billion (ppb) detection limit. Splits of all samples were retained for future petrological and geochemical study.

This geochemical survey was to determine whether gold anomalies that could be used to identify favourable targets are detectable at the reconnaissance exploration stage. Fieldwork also included measurements of the attitude of quartz veins, bedding and cleavage(s), as well as local geological mapping to determine the structural context of quartz veins.

RESULTS AND CONCLUSIONS

These tentative conclusions are based on a limited number of observations and on the geochemical determinations available at the time of writing.

1. A positive gold geochemical anomaly appears to be associated with turbidites in the vicinity of auriferous quartz veins. For example, on Giant Bay Resources' gold property at Gordon Lake, 16 rocks were collected within a zone measuring about 1 square km. Only three of these had less than 5 ppb gold (the detection limit). Nine samples ranged from 7 to 53 ppb gold (average 24.1 ppb). One sample of greywacke had 462 ppb gold and three samples of argillite had to be re-assayed because gold contents were beyond the upper sensitivity of the geochemical test. The latter returned 2.5, 4.5 and 17.6 g/t gold. Because these last four samples were the only ones collected that include appreciable arsenopyrite, an ancillary conclusion appears to be that the presence of arsenopyrite in country rocks is a good indicator of gold mineralization. Two samples of quartz-vein material were also collected on the Giant Bay property. One of these had 12 ppb gold and the other, which was collected immediately adjacent to the argillite sample that assayed 17.6 g/t Au, had only 38 ppb gold.

For comparison, an equivalent-size quartz-veined area at Akaitcho Bay, where gold showings have not been found, was sampled. Eight argillite and greywacke samples were analyzed. Five had gold contents that fell below the 5 ppb detection limit, and three yielded 7 to 9 ppb gold. In addition, three samples of quartz-vein material were collected, and all had less than 5 ppb gold.

Additional sampling, which will be done next summer, is required to test the efficacy of rock geochemistry as a tool for evaluating gold potential.

2. Argillite appears to be the preferred host rock for auriferous quartz veins. Locally the argillite forms thin selvages along the margins of quartz veins in terrain otherwise dominated by coarser clastics. More commonly, though, the auriferous veins are in areas where argillite is more preponderant than the norm. Since the basin is underlain by about 70% coarse clastics and only 30% fine clastics, the scope of exploration can be narrowed considerably if chances of success can be demonstrated to be greatest in the finer-grained rocks. Moreover, since thick packages of argillaceous rocks will weather more easily than their arenaceous counterparts, considerable potential is indicated for those parts of the basin that are unexposed. These, of course, also happen to be the areas that are least prospected. It is instructive to note that

Giant Bay Resources' main zone at Gordon Lake is almost entirely covered by swamp.

3. Gold-bearing veins appear to be related to deformation in at least five of the deposits that I evaluated. At Giant Bay's Gordon Lake property, at the No. 31 vein on Zenith Island and at the Ruth Mine, gold is concentrated in stratabound or stratiform veins along the limbs of isoclinal F1 folds where they have been deformed by later, open F3 (?) folds. At Blackridge and Camlaren, gold is concentrated in stratabound or stratiform quartz veins around the noses of F1 isoclines. All of these structural scenarios involve the formation of low-pressure zones into which gold and quartz is likely to migrate. Gold can also be associated with later quartz veins that cut across bedding (eg., Ptarmigan Mine). These observations suggest that gold was deposited during several stages in the tectonic development of the basin, or perhaps that the main "pulse" of gold mineralization was during F1 folding, and some gold was remobilized and reconcentrated into favourable structures by later episodes of deformation.

Shearing does not seem to be an important factor in the development of the gold-bearing quartz veins that I saw.

FUTURE WORK

Future work will include additional geochemical surveys and detailed geological mapping of selected gold showings representing a variety of structural sub-types (ie., saddle reefs at F1 fold closures, veins related to F3 folds, crosscutting veins, etc.). Samples will be thin-sectioned and studied to examine microstructures and alteration features. Areas devoid of gold-bearing quartz veins will also be surveyed in order to establish a control against which data from auriferous zones can be compared.

ACKNOWLDEGEMENTS

I am especially grateful to Dr. William Fyson of Ottawa University, who has spent years unravelling the complex structural history of the basin and who has patiently shared whatever knowledge I can absorb of his current studies on the relationship between style of quartz veining and basin structure. I also thank Dr. William Padgham of the Northern Affairs Program for his support and encouragement.

THE INDIN STRUCTURAL BASIN: TECTONIC HISTORY AND ITS SIGNIFICANCE TO GOLD EXPLORATION

R.A. Frith
Precambrian Geology Division
GSC Ottawa

The Indin Structural Basin (ISB) at the west margin of the Slave Province is filled by volcanic and sedimentary rocks of the Yellowknife Supergroup (YKSG). The basin was deformed and metamorphosed, not only during the Archean, but also during the Proterozoic by events associated with the Wopmay Orogen. Both have had an effect on the distribution of rocks and metamorphic isograds and hence gold occurrences.

GEOLOGY

The Indin greenstone belts are typical of the Slave Province consisting of thick, pillowed basaltic flows that thin toward one margin, where they become more felsic and more mineralized. The volcanics, in general, trend northwestward and thin southeastward, where they are locally interfingered and underlain by metasedimentary rocks. Basement rocks are found on both sides of the ISB, but are more prevalent in regions of lower grade regional metamorphism. Where grade is higher, plutonic and migmatitic rocks are more abundant.

The YKSG rocks in the ISB were deformed by an event analogous to the Kenoran Orogeny. Outside of the ISB the deformation is mostly single phase (D1), but within the basin a later phase (D2) is oriented parallel to the present length of the basin. Most plutons and migmatitic terrane have structures that suggest they were emplaced during D1, as they have a common gneissosity. A few generally more mafic plutons have internal gneissic structures that imply earlier emplacement.

GOLD MINERALIZATION

Gold-bearing veins in the ISB, most commonly cut Yellowknife Supergroup rocks and have not been reported cutting diabase, gabbro or any granitoid rocks. Gold in the Colomac deposit occurs in fractures developed in quartz-albite rock, which has been interpreted as a synvolcanic sill. Gold-bearing veins within volcanic strata, generally have higher gold contents than veins within metasedimentary rocks. The highest gold values in metasedimentary rocks are those closest to the volcanic-sedimentary interface, the presumed source. Gold is common in sheared rock, occuring in volcanics, along the interface and within the metasediments.

Early gold prospect developments (1951) include the Diversified shaft, the North Inca shaft and the Lexindin deposit, all along the same shear zone. Other deposits in the area are along fracture or shatter zones associated with northerly trending shears, likely associated with D2. It is noteworthy that few if any of the showings in the area are associated with the northwest-trending oblique-slip fauits. Gold showings are most commonly associated with rocks of greenschist facies regional metamorphism. Antimony-bearing minerals, common to the Yellowknife area

deposits, have not been reported from Indin Lake.

Quartz veins and stringers are widely distributed through the area and only locally are grouped and abundant, where they form zones up to 4 m wide that may extend up to 100 m along strike. Most veins are lenticular, narrowing and swelling in irregular fashion, commonly pinching out at both ends. The lenses may be up to 2.5 m wide and some are at least 20 m long. Groups of veins occupy sheared rock, whereas large single veins are most commonly associated with bedding and cleavage planes associated with D2.

PROTEROZOIC TECTONISM

At about 2.0 Ga, the west margin of the Slave craton was pulled apart by east-west extension, forming rifted basins to the west filled by Proterozoic sediments. The east margin of the ISB was intruded by epizonal granodioritic stocks at this time along a zone of weakness separating the ISB from tonalitic basement to the southeast. Gabbro sills intruded the Proterozoic sediments and these sills have been correlated with the northwest- and east northeast-striking dykes of the Indin Diabase. Westward subduction of the Slave plate beneath the Bear plate culminated in the Calderian Orogeny. Proterozoic sediments were thrust eastward on to the Slave craton along sole faults forming a tight, easterly verging, allochthonous, folded sedimentary wedge, into which intruded 1.89 Ga. granite plutons of the Hepburn Intrusive Suite, melted from the underlying Slave basement.

The east-west compression of the Slave Province, during the Calderian Orogeny, caused a downwarping of the more dense supracrustal basin areas and an upwelling of more buoyant granitoid areas. Within the ISB, more readily deformed rocks were folded along axes that trend north-northwest, superimposing an upright cleavage in less competent rocks and commonly parallel joint sets in volcanic and granitoid rocks. Continued compression following regional metamorphism caused brittle failure in the internal zones of the Wopmay Orogen, where sinistral southwest and dextral northeast strike-slip faults accomodate north-south extension. These faults cut plutons of the Great Bear magmatic zone, dated between 1.86 and 1.85 Ga. In the ISB equivalent, southeast strike-slip faults dissected the basin into segments, re-orienting the basin from a northeast-trending linear shape to a more extended, northerly one. Further downwarping of the basin and uplift of adjacent granitoids took place at this time, which apart from minor Mackenzie Diabase dyking, marked the close of tectonism in the ISB.

The occurence of low grade, regionally metamorphosed YKSG rocks with their potential gold mineralization is thus controlled, in part, by Proterozoic tectonic events, which provide a framework for paleogeographic reconstruction of favourable prospecting environments.

Gold and Global Tectonics

W.S. Fyfe
Department of Geology
University of Western Ontario

There is now good evidence that gold is often mobilized by large volumes of warm (100-400°C) low salinity fluids. Thus the search for gold involves the search for tracks of the passage of very large volumes of such fluids. Typically, the prime indicator is provided by quartz veins and silicification with or without a large number of other indicators. Given such fluids, source and host rocks may be highly variable. Examples of the flow of such fluids will be taken from Archean granite-greenstone tectonics and more modern subduction, collision and metamorphic environments including fault and shear zone phenomenon, and environments of igneous intrusion into gold-enriched sediments. The potential of finding new types of gold deposits is considered to be large.

SPECULATIONS ON THE ORIGIN OF RARE EARTH-CARBONATITE SYSTEMS

W.D. Groves, Ph.D. P.Eng.
Archaean Resources Corp., Vancouver, B.C.

Patrick J. Gannon, P. Geologist
Geological Consultant, Vancouver, B.C.

Abstract

Tectonic features and element suites of Thor Lake (Great Slave Lake, NWT) and "Thor Lake East" (Khanneshin, Afghanistan) complexes are compared. Recent particle physics and geo-astronomic data suggest a possible extra-terrestrial origin for such terrestrial Star Wars Metals deposits.

Collision of Indian and Asian tectonic continental plates (Asian generally overriding) has resulted in deep rifting and also deep-level crustal exposure in Afghanistan. This has resulted in exposure of geologically recent pegmatite fields, and escape of sub-plate accumulations of carbonatite-rare earth magma systems up rifts (Khanneshin carbonatite-rare earth stratovolcano).

The extreme recentness of the Khanneshin upwelling (lower Quaternary) preserves large erosional remnants of a calderic stratovolcano. Tuffs containing carbonatite are identifiable in the cone sheet. The vent area is now filled with a late resurgent, intrusive rare-earths

carbonatite complex.

Thor Lake, NWT, of basal Aphebian age, on the rifted edge of the Archean Slave Craton, is now erosionally transected at a considerably deeper level than Khanneshin. At Thor Lake only certain structural clues still exist, which suggest high fluid pressures and/or venting. These include a central carbonatite breccia-block pipe and peripheral injections of carbonatite-peralkaline phase dykes. There is an abrupt wet-granite/dry-syenite transition between the Grace Lake Granite and Thor Lake Syenite suggesting sudden loss of early, water-rich fluids by venting. The abrupt mineralogical transition between the (wet) Grace Lake Granite (rim) and the (dry) Thor Lake Syenite (core) suggests the two were in equilibrium with different volatile phases. Corollaries are that the latter is unlikely to be a buoyant feldspar-rich roof phase differentiated by the former, as well as suggesting both earlier phreatic venting (greisens: R and S zones) and later CO_2 venting (central block-breccia pipe). The Afghan complex certainly vented (caldera and stratovolcano remnants) at the CO_2 -rich stage. Whether an earlier, deeper wet-siliceous pluton or highly radioactive reactor core surrounds/underlies the CO_2-rich central phase at depth is not known.

The very different levels of unroofing of the two complexes help give additional geological perspectives on this type of deposit.

REPORT ON STATUS OF YELLOWKNIFE VOLCANIC BELT PROJECT

H. Helmstaedt
Department of Geological Sciences,
Queen's University

The purpose of this project is the preparation of a 1:10,000 scale map series of the entire Yellowknife volcanic belt with the aim of refining the stratigraphy of the Yellowknife Supergroup and of establishing the geological controls of the gold-bearing shear zones.

Two areas in the Kam Group were mapped during the 1985 field season: 1) the lowermost part of the Kam Group west of the West Bay Fault, north of the City of Yellowknife; and 2) a narrow area between the Octopus Lake area (Helmstaedt and others, 1979) and the map-area of Henderson and Brown (1966), stretching from the southwestern end of Kam Lake to Yellowknife Bay, in the southern part of the belt.

Mapping in the first area was designed to study the boundary between the Chan and Crestaurum Formations, two newly defined formations of the Kam Group. The Kam Group was established by Helmstaedt and Padgham (in press) who raised the Kam Formation of Henderson (1970) to group rank and divided it into four formations. These formations are: (1) the Chan Formation, forming the basal unit of the Kam Group and named for its main exposure south of Chan Lake; (2) the Crestaurum Formation, named for the Crestaurum Mine and traversed by the road leading to the mine; (3) the Townsite Formation, consisting of the Townsite Flows of Henderson and Brown (1966); and (4) the Yellowknife Bay Formation, named for its exposures along Yellowknife Bay and including all rocks of the upper parts of the Kam Group between the Townsite and Kam Sills.

The boundary between the Chan and Crestaurum Formations is drawn at the Ranney Chert, the lowermost of a number of laterally continuous marker beds in the Kam Group mapped by Henderson and Brown (1966). The Ranney Chert, consisting of up to four separate beds of cherty tuff with a total thickness of up to 10 m, can be traced from the granodiorite contact south of Fox Lake to the east to the West Bay Fault, approximately 300 m northwest of the Giant A shaft. Individual beds are locally boudinaged, offset by faults, disrupted, displaced and rotated in gabbro intrusions, or split up into several beds by gabbro sills. East of the West Bay Fault, the Ranney Chert reappears west of David Lake, is displaced further to the northwest by the Akaitcho Fault and, although locally missing, can be traced northeastwards to Banting Lake, near Berry Hill, where it is truncated by the unconformity at the base of the Jackson Lake Formation. The mafic flows of the Chan Formation, up to the level of the Ranney Chert, have been intruded by gabbros to form an intrusive-extrusive mafic complex with high-level gabbros, anorthosites, multiple dikes, sills, and irregular gabbros resembling the transition zone from gabbros through sheeted dikes into pillow lavas typical of Phanerozoic ophiolites. In the Crestaurum Formation, irregular gabbros are rare, but the upper part of this formation, the Townsite Formation, and the lower part of the Yellowknife Bay Formation were invaded by a gabbro sill complex that sent numerous multiple dikes into the Yellowknife Bay Formation, east of the West Bay Fault. This upper multiple dike set is absent west of the West Bay Fault, where all formations of the Kam Group were intruded by a still later dike swarm (Unit 8 of Henderson and Brown, 1966). The extrusive-intrusive relationships within the Kam Group were investigated to establish their geotectonic implications for models of greenstone belt formation.

Mapping between the southwestern end of Kam Lake and Yellowknife Bay was necessary to fill in a gap in previous detailed mapping and to correlate the geology between the Octopus Lake area and the area around Kam Point. This field work effectively ends the mapping component of the project. Future work will consist of

the compilation of maps, local field checking and the integration of structural data for the belt.

ACKNOWLEDGEMENTS

The continued support for this study by the Northern Affairs Program is gratefully acknowledged. Discussions with W.A. Padgham were very helpful. I greatly appreciated the enthusiastic help of John Brophy during the mapping, especially during the tracing of cherts into his detailed map area at Fred Henne Park.

REFERENCES

Helmstaedt, H., Goodwin, J.A., Patterson, J. and King, J.E., 1979:
Preliminary geological map, southern end of Yellowknife greenstone belt; Indian and Northern Affairs Canada, EGS 1979-9.

Helmstaedt, H. and Padgham, W.A., in press:
A new look at the stratigraphy of the Yellowknife Supergroup at Yellowknife, NWT - implications for the age of gold-bearing shear zones and Archean basin evolution. Canadian Journal of Earth Sciences.

Henderson, J.B., 1970:
Stratigraphy of the Yellowknife Supergroup, Yellowknife Bay-Prosperous Lake area, District of Mackenzie; Geological Survey of Canada, Paper 70-26, 12 p.

Henderson, J.F. and Brown, I.C., 1966:
Geology and structure of the Yellowknife Greenstone Belt, District of Mackenzie; Geological Survey of Canada, Bulletin 141, 87 p.

THE GEOLOGY AND GENESIS OF THE BULLMOOSE LAKE TURBIDITE-HOSTED GOLD DEPOSIT

R. Tim Henneberry
Senior Geologist, Terra Mines Limited
Bullmoose Lake Gold Project
Yellowknife, NWT

The Bullmoose Lake turbidite-hosted gold deposit is 85 km east-southeast of Yellowknife, Northwest Territories. The area is underlain by the Archean Slave Structural Province of the Canadian Shield. The Bullmoose Lake gold deposit lies within a fault-bounded turbidite basin, in which three periods of structural deformation are identified. Host rocks are well-bedded, amphibolite grade greywackes and mudstones of the Yellowknife Supergroup Burwash Formation.

The property geology is dominated by a tightly folded, northwesterly striking syncline, that plunges shallowly to the north. The west limb of this syncline has then been open-folded about an axial plane striking northeasterly and plunging steeply north. Later regional events have overprinted a pervasive northerly to northwesterly striking foliation.

Three quartz vein morphologies have been documented at Bullmoose Lake. Bedding-parallel quartz veins, the most important morphology, are parallel to and sub-parallel to the strike and dip of the hosting metasedimentary rocks. Foliation-parallel quartz veins are parallel to and sub-parallel to the axial trace of the F1 syncline. Crosscutting veins cut both the bedding- and foliation-parallel veins. Bedding-parallel and foliation- parallel quartz veins account for all of the economic gold-bearing veins on the property.

The ore mineralogy includes free gold, pyrite and pyrrhotite, with lesser chalcopyrite, and traces of arsenopyrite, galena, sphalerite and scheelite. The gangue minerals consist of blue-grey quartz, chlorite and biotite, with lesser muscovite, plagioclase and K-feldspar, and traces of carbonate.

Comparing the Bullmoose Lake gold deposit with other previously or presently producing properties within the Yellowknife Supergroup reveals several common features. These include: 1) a host rock comprised of well-bedded mudstone and greywacke; 2) a predominance of bedding-parallel quartz veins; 3) a complex structural history; 4) a 250 to 350 C depositional temperature; 5) auriferous blue-grey quartz and 6) association of free gold with sulphides. Based on these criteria, a genetic model for the Bullmoose Lake turbidite-hosted gold deposit has been presented. The model invokes turbidite sedimentation with incipient gold supplied by fumarolic activity at the Burwash Formation basin margin. The folding sequence initially liberated the gold and quartz from the sediments by lateral secretion, then remobilized and reconcentrated the gold and quartz into the present bedding- and foliation-parallel veins.

GEOLOGY OF EASTERN HEPBURN ISLAND AREA (76M)

V. Jackson, Project Geologist
Northern Affairs Program, Yellowknife

The eastern Hepburn Island map area is in the northern Slave Province, approximately 555 km north of Yellowknife, and is bounded to the north by the Coronation Gulf.

Previous work in the area includes reconnaissance mapping by Fraser (1964) and Baragar (1975). Henderson (1975) discovered Archean stromatolites in the High Lake area (76M/7) and Tirrul and Bell (1980) produced a regional map of the Anialik River volcanic belt. Several DIAND supported crews have worked in the Hepburn Island map sheet: Padgham and others (1974); Easton and others (1982); Yeo and others (1983); and Jackson and others

(1984). The area has been explored for lead, zinc, silver and gold.

Work in July and August 1985 was aimed at completing maps of the Hepburn Island area, with concentration on the southern extension of the High Lake volcanic belt (HLVB: 76 M/2). An additional volcanic belt, here named the James River volcanic belt (JRVB), was mapped in the southeastern portion of the map area (76 M/1). Mapping was carried out at a scale of 1:30,000 in the volcanic belts and 1:50,000 in the surrounding granitoids.

Both the southern HLVB and JRVB consist of a variety of volcanic, sedimentary and mafic intrusive rocks bounded by younger granitoids. Volcanic rocks of the HLVB and JRVB are similar in composition and texture; the main difference being the higher metamorphic grade and locally more intense deformation of the latter. The main portion of the southern HLVB has undergone greenschist facies metamorphism, with metamorphic grade increasing to middle amphibolite in the vicinity of the bordering granitoid terrane. The JRVB appears to have been metamorphosed to amphibolite grade and is more extensively intruded and engulfed by granitoids than the HLVB.

Mafic volcanics are dominantly flows, commonly pillowed and amygdaloidal. Pillows are generally small and have thin, fine-grained and compositionally distinct selvages.

Pillow-breccia layers are abundant. Thinly banded, fine-grained, mafic to intermediate volcanics (tuffs?) are common near the margins of HLVB and in the Mineral Lake area, where mafic fragmentals are also found. Intermediate volcanics include pillowed flows, fragmentals and massive, brown-weathering rocks which may represent andesitic flows, crystal tuffs, or in some cases, dikes. Massive intermediate volcanics appear to grade locally into dacitic flows (?) with little change in external appearance. Pillows of intermediate composition are generally larger, have thicker selvages and are commonly more irregular in outline than those of mafic composition. Pillow cores are generally more siliceous or epidote-rich than rims and contain quartz amygdules and plagioclase phenocrysts. Felsic volcanics are dominated by fragmentals, mainly lapilli tuffs, although block-size fragments were noted locally. Thinly layered felsic volcanics (ash tuffs?) are abundant in the Mineral Lake area of HLVB and in the JRVB. Massive quartz-eye rhyolite is present in small amounts. Quartz-feldspar porphyry units, containing felsic fragmental zones and siliceous gossans, are found within both the HLVB andJRVB. These bodies may represent rhyolitic to dacitic volcanic or subvolcanic domes.

Sedimentary rocks include: limestones; volcaniclastic sediments; calcareous sandstones; slates; wackestones; conglomerate; and abundant turbidites. Well-bedded limestones are common in the Mineral Lake area (HLVB), where they are interbedded with fragmental volcanic rocks, ash tuffs and/or volcaniclastic sediments. Interbedded calcareous sandstone and slate (gritstone-mudstone) are found adjacent to volcanic rocks. Slates are typically graphitic and sulfide-bearing, locally containing banded, sulfide iron formation. Rare thin chert beds and felsic volcanic or volcaniclastic layers are found within the clastic rocks. Coarse-grained wackestone and conglomerate occupy the main portion of the syncline outlined by Baragar (1975), who classified these rocks as fragmental felsic volcanics. The conglomerate consists of subrounded to well-rounded, aphanitic, felsic-volcanic and quartz-feldspar phyric (plutonic in origin?), matrix-supported clasts ranging in size from pebbles to boulders. The greywacke matrix may have been derived from intermediate volcanic rocks. Isolated conglomerate beds containing a wide variety of well rounded felsic-volcanic, plutonic and sedimentary clasts are found within the turbidites.

Most of the eastern Hepburn Island area is underlain by granitoids which can be classified into two groups according to relative time of emplacement. Early (pre- to synkinematic) plutonic rocks, in general, consist of more "mafic" granitoids, while more "felsic" granitic rocks constitute a later phase of emplacement (late synkinematic to possibly postkinematic). Concentrations of gabbroic intrusions are noted within volcanics and sediments along both the eastern and western margins of the HLVB. These gabbros post-date emplacement of the rhyolitic-dacitic dome, but pre-date granite emplacement and have been macroscopically folded. Gabbro, diorite, quartz diorite, hornblendite, granodiorite and tonalite are spatially associated with JRVB and sedimentary rafts within the granitic terrane.

Several different plutons have been outlined within the felsic granitic rocks. Margins of the plutons are locally marked by xenolith-rich zones and/or a well-defined foliation. In some cases it appears possible to define plutons on the basis of mineralogical boundaries. Biotite granite underlies a large area in the northern portion of the map area and is likely correlative with pluton C of Easton and others (1982). Equigranular, muscovite-rich, biotite granite in the northeastern portions of 76 M/16 and along the James River intrudes older granodiorite-diorite, biotite granite and sediments and volcanics of the JRVB. Megacrystic biotite granite is widespread along the eastern margin of the HLVB. This granite has a distinctive rapakivi texture

and s only weakly foliated.

Proterozoic gabbro/diabase dikes and sil and rare syenite dikes are the your est intrusions in the area.

Regionally, the HLVB has been def(ned into a major north-trending syn(ine. A subsidiary antiform in the cen al portion of this syncline may exp in the exposure of the felsic vol(nics in the Mineral Lake area. These str(tures have been subsequently modified by mplacement of the bordering granitic rock . Structural trends in the JRVB appe r to have been much more modified by plu n emplacement. All granitoids in the map rea display evidence of deformation, alt ugh the foliations that have formed var in intensity.

At least two distinct ages of fau ing are recognized. Two major nor -trending shear zones have been def ed in the northeast and southeast HLV The development of a penetrative fol tion in these shear zones suggests the pre-date northwest-trending faults, whi lack associated fabric development anc are likely of Proterozoic age. One suc late fault has an apparent right lat al strike-slip displacement of about 1.5 m. The Proterozoic Bathurst Fault sys m, which transects the northeastern map area near Inman Harbour, is associated wit pervasive brittle deformation of gra tic rocks.

Mafic volcanics locally host bornite anc chalcopyrite and may contain sul de-bearing quartz veins hosted in sne zones. Banded magnetite iron for ation is associated with intermediate vol anic rocks (andesitic flows?) in the nor heastern HLVB. Siliceous gossans, ma ly pyritiferous, are common within fel ic volcanics (fragmental, massive and por yritic variations), particularly along the contacts with more intermediate com sitions or with sedimentary rocks.

Adjacent to and within faults zones, gra itic rocks are host to specular hem tite. Specularite-bearing quartz veins are locally observed in these faults zones anc are abundant in the vicinity of the Ba urst Fault zone. A single su ide-bearing quartz vein, hosted in shr red granite, is recorded. Mafic inc usions in granitic rocks near Inman Har our are reputed to be carvable. Minor ma chite staining is noted in some of the Pro erozoic diabase dikes.

REF RENCES

Ba gar, W.R.A., 1975:
Miscellaneous data from volcanic belts at Yellowknife, Wolverine Lake, and James River, Northwest Territories; in Report of Activities, April to October, 1974; Geological Survey of Canada, Paper 75-1A, p. 281-286.

Easton, R.M., Ellis, C., Dean, M., Bailey, G., Bruneau, H.C. and Wahlroth, J., 1982:
Geology of Typhoon Point map area, High Lake greenstone belt, 76 M/10, 76 M/15 (southwestern half); Indian and Northern Affairs Canada, EGS 1982-6.

Fraser, J.A., 1964:
Geological notes on northeastern District of Mackenzie, Northwest Territories; Geological Survey of Canada, Paper 63-40, 20 p.

Henderson, J.B., 1975:
Archean stromatolites in the northern Slave Province, Northwest Territories, Canada; Canadian Journal of Earth Sciences, v. 12, no. 9, p. 1619-1630.

Jackson, V.A., Crux, J., Ellis, C.E., Howson, S., Padgham, W.A. and Relf, C., 1985:
Geology of the Mistake Lake area, Anialik River greenstone belt, NWT, 76 M/11; Indian & Northern Affairs Canada, EGS 1985-5.

Padgham, W.A., Shegelski, R.J., Hughes, D.R. and Jefferson, C.W., 1974:
Geological map of the High Lake area (76 M/7), District of Mackenzie, NWT; Geological Survey of Canada, Open File 208.

Tirrul, R. and Bell, I., 1980:
Geology of the Anialik River greenstone belt, Hepburn Island map area, District of Mackenzie; in Current Research, Part A; Geological Survey of Canada, Paper 80-1A, p. 157-164.

Yeo, G.M., Bailey, G., Crux, J., Fischer, B., Jackson, V., Relf, C. and Wahlroth, J., 1983:
Preliminary geology of western Hepburn Island map area, NWT, 76 M (west Half); Indian and Northern Affairs Canada, EGS 1983-8.

GEOLOGY OF QUYTA LAKE AREA (85 J/16)

V. Jackson, Project Geologist
Northern Affairs Program, Yellowknife

Quyta Lake is approximately 40 km north of Yellowknife and forms part of the Yellowknife River system. Quyta Lake map area is underlain by Archean granitoids, and volcanics and sediments belonging to the Yellowknife Supergroup. The area, which lies at the northern end of the Yellowknife Volcanic Belt (YKVB), was first mapped by Jolliffe (1939, 1940) and later by Henderson (1976). Detailed mapping (1:10,000 scale) has been carried out in the three main centers of volcanic accumulation: Clan Lake complex (Hurdle, 1983, 1984); Sito Lake and Quyta Lake volcanics (Yeo and others, 1983) and Sito Lake complex (Helmstaedt and others, 1985). Mapping in June, 1985 was aimed at completing 85 J/16 map sheet by: 1) mapping Quyta Lake volcanics and any unmapped portions of the YKVB map series at a scale of 1:10,000; and 2) mapping rocks

surrounding YKVB for eventual compilation at a scale of 1:50,000.

The western map area is underlain by granitoids of at least two generations; an older, foliated and lineated, locally gneissic to migmatitic granite is intruded by a younger, less deformed leucogranite. These granitic rocks are either in intrusive or fault contact with overlying mafic volcanics of the Yellowknife Supergroup. Mafic volcanics comprise undifferentiated amphibolite, pillowed and massive basalt, gabbro and tuffaceous rocks with minor intercalated felsic tuffs and volcaniclastic sediments. These volcanics generally young to the east, away from the granitoid terrane, except in the area north of Nelson Lake, where folding has reversed facing directions (Helmstaedt, 1984). Most of the eastern map area is underlain by sedimentary rocks dominated by coarse-bedded sandstones with minor mudstone, that contain features characteristic of proximal turbidites. Turbidites are seen to overlie mafic volcanics in the Sito Lake area. It is within the sedimentary pile that the three dominantly felsic to intermediate volcanic complexes (Clan Lake, Sito Lake and Quyta Lake) are found. Numerous gabbroic to dioritic sill-like bodies have intruded the sedimentary rocks. East of Quyta Lake the sills are found within sedimentary rocks, while west of Sito Lake they are concentrated near sediment-volcanic contacts. Sedimentary rocks in the southeastern map area are invaded by muscovite, plus or minus tourmaline-bearing pegmatites and granites. Proterozoic gabbro and diabase dikes have intruded all Archean rock types.

The area is transected by a major north-trending fault zone that represents the extension of the Proterozoic Hay-Duck fault system. Left lateral strike-slip motion along this fault, documented by Jolliffe (1942) and Helmstaedt and others (1980), if removed, would juxtapose Clan Lake complex with the more distal Sito Lake equivalents (Helmstaedt, 1985).

Most of the area has been metamorphosed to amphibolite grade: turbiditic rocks contain cordierite, andalusite and locally, sillimanite and garnet; and volcanic rocks are often garnetiferous. A narrow zone trending northeast through Clan Lake to Johnstone Lake has been metamorphosed to greenschist facies. The metamorphic peak predates the last phases of deformation.

Quyta Lake Volcanics

Mafic volcanics to the west of Quyta Lake are separated from felsic to intermediate rocks of Quyta Lake complex by the strike-slip fault. West of the fault pillowed and massive basaltic flows are intruded by sheet-like gabbro dikes. Pillow breccia horizons are locally epidotized and contain interstitial magnetite. Basalts also contain felsic layers, some of which may represent quartz-eye rhyolite dikes, while others containing fiamme-like fragments may represent quartz crystal tuffs. These felsic layers are also found within the highly deformed, layered quartz-feldspar crystal-rich intermediate (?) volcanic rocks that are restricted to a zone immediately west of the fault and in one location on the east side. Although these rocks are highly sheared, it is likely that the layering is primary as a segregation cleavage can be recognized that is distinctly tectonic in origin and is discordant to the layering. These layered rocks resemble those found on the north and south shore of Sito Lake and may represent crystal tuffs.

East of the fault, Quyta Lake complex comprises highly altered (silicified, amphibolitized and garnetiferous) pillow volcanics, pillow breccia, volcanic breccia, andesitic flows(?), rhyolite, tuffs, volcaniclastic sediments, chert and graphitic sulfide-rich argillites. This sequence of rocks occurs within the sedimentary pile, overlying coarse-bedded sandstones, and is interbedded with sandstone-mudstone turbidites and more argillaceous sediments.

Quyta Lake complex is folded into one and possibly two structural depressions, with an intervening dome occuring within coarse-bedded sandstones. Isoclinal folds in the surrounding sediments are wrapped around and overturned away from the complex. The resulting interference pattern outlined by Quyta Lake complex and the gabbro sills to the east is similar to that determined for Sito Lake area (Helmstaedt and others, 1985; Little, 1985).

REFERENCES

Helmstaedt, H., King, J. and Boodle, R., 1980:
Preliminary geology map of Banting and Walsh Lakes area, 85 J/9; Indian and Northern Affairs Canada, EGS 1980-5.

Helmstaedt, H., Bell, R., Ellis, C.E., Howson, S., Jackson, V.A. and Relf, C., 1985:
Geology of Sito Lake area, 85 J/16; Indian and Northern Affairs Canada, EGS 1985-10.

Henderson, J.B., 1976:
Geology of Hearne Lake (85 I) and Yellowknife (85 J) map areas; Geological Survey of Canada, Open File 353.

Hurdle, E., 1983:
Geology of a volcanic pile at Clan Lake, NWT, parts of 85 I/13, J/16; Indian and Northern Affairs Canada, EGS 1983-5.

_____, 1984:
Geology of a volcanic pile at Clan Lake, NWT; in Contributions to the Geology of the Northwest Territories,

v. 1, J.A. Brophy, ed.; Indian and Northern Affairs Canada, EGS 1984-6, p. 79-90.

Jolliffe, A.W., 1939:
Preliminary maps, Quyta Lake and parts of Fishing Lake and Prosperous Lake areas, Northwest Territories; Geological Survey of Canada, Paper 39-6.

---------- , 1940:
Quyta Lake and parts of Fishing Lake and Prosperous Lakes areas, Northwest Territories; Geological Survey of Canada, Paper 40-14, 9 p.

Little, R.N.:
Structural and petrographic study of Sito Lake, NWT; unpublished B.Sc. thesis, Queen's University.

Yeo, G.M., Bailey, G., Crux, J., Fischer, B. Jackson, V., Reif, C., and Wahlroth J., 1983:
Preliminary geology of Quyta Lake area, NWT (parts of 85 J/9,16); Indian and Northern Affairs Canada, EGS 1983-7.

GEOLOGY OF THE WILSON ISLAND GROUP, GREAT SLAVE LAKE, NWT

B.J. Johnson
Department of Geology
Carleton University

A two-summer mapping project was initiated in 1984 to study the lower Proterozoic Wilson Island Group, the oldest supracrustal succession in the East Arm of Great Slave Lake. The Wilson Island Group is exposed in a discontinuous belt extending from the Outpost Islands northeastward to Basile Lake. Exposures in the western part of the belt (Outpost Islands to Wilson Island) lie south of the McDonald-Wilson fault, a major dextral transcurrent fault. Exposures on islands northeast of Wilson Island and in the Basile Bay - Basile Lake area are north of the fault. Other major northeast-trending faults separate Wilson Island Group rocks from younger rocks of the Great Slave Supergroup. Field work in 1984 focused on establishing the stratigraphy on Wilson Island and in the Basile Bay area. During the 1985 season 1:25,000 scale mapping of these areas was completed, stratigraphic sections were measured, and samples of volcanic units were collected for geochronology.

A complex assemblage of arenaceous and conglomeratic arkoses, volcaniclastic rocks, mafic and felsic volcanics, and felsic intrusions form the lower part of the section on Wilson Island. The greatest apparent thickness of volcanic units occurs on islands southwest of Wilson Island, where rhyolite flows are the dominant lithology. The upper part of the Wilson Island section consists of medium-grained arkose to subarkose intercalated with shallow or marginal marine dolostone and dolomitic sandstone. A westward decrease in the siliciclastic/carbonate ratio and an abundance of westerly directed trough crossbeds indicate that a terrigenous source was to the east.

Arkoses, argillaceous siltstones, and dolostones at Basile Bay are overlain by fine- to medium-grained subarkose and arkose, sandy and argillaceous siltstone, iron formation, and mudstone. The rocks at Basile Bay form a nearly isoclinal, southeast-plunging reclined syncline and several smaller folds. From the hinge area of the syncline northeastward to Basile Lake, fold plunges change from southeast to northeast. A southwest-plunging stretching lineation is commonly exposed on foliation surfaces in hinge areas of folds and along the major boundary faults. The lineation is also extensively developed in the volcanic rocks in the Wilson Island area.

The structure at Wilson Island is characterized by a network of northeast- and northwest-trending faults, most of which are related to the McDonald-Wilson fault system. Open, east-plunging, inclined folds with steep north-facing limbs are most abundant adjacent to major faults and may also be related to transcurrent faulting.

On the Outpost Islands, micaceous and pebbly quartzites are intercalated with greywacke and schist. Greywacke units exhibit elongate pebbles, boulders, and boudinaged beds of quartzite, which define a steep, southeast- to northeast-plunging stretching lineation on foliation surfaces. Open, inclined folds plunging gently northeast are refolded by steeply plunging kink-like folds, which also deform sheared and sericitized sulfide zones. Sulfide zones are also locally developed in association with felsic volcanics in the Wilson Island area.

DEPOSITIONAL ENVIRONMENTS DURING A GLACIOLACUSTRINE TO MARINE TRANSITION IN THE BASIN OF THE RICHARDSON AND RAE RIVERS, NWT

Daniel E. Kerr
Ottawa-Carleton Centre
for Geoscience Studies,
Department of Geology
University of Ottawa

This study describes the principal glaciolacustrine deposits of Glacial Lake Richardson and its transition to a postglacial sea following the retreat of a lobe of the Laurentide ice sheet from the Richardson and Rae River basins. The glaciolacustrine to marine transition is characterized by an upward-fining trend representing the proglacial lacustrine environments, succeeded by an upward-coarsening trend corresponding to the regressive marine sequence. A composite

stratigraphic section includes: a) basal till; b) stratified subaqueous outwash sand and gravel; c) glaciolacustrine silty clay rhythmites; d) massive marine silty clay; and e) littoral marine sands. The sudden passage from lacustrine to marine environments is reflected in the abrupt change in depositional mechanisms. Turbidity currents prevailed in the proglacial lake as inferred from thick sequences of varve-like couplets, whereas the salinity of marine waters, impeding the sedimentation of fines by heavy-density bottom flows, lead to the rapid deposition of massive structureless marine clays by flocculation.

THRUSTING BETWEEN THE CAMERON RIVER GREENSTONE BELT AND THE SLEEPY DRAGON METAMORPHIC COMPLEX SLAVE PROVINCE, DISTRICT OF MACKENZIE

Timothy M. Kusky
Department of Earth and Planetary Sciences
The Johns Hopkins University
Baltimore, Maryland, U.S.A

INTRODUCTION

The Archean Slave Province is a granite-greenstone terrane in the northwestern portion of the Canadian Shield. Unconformities between greenstone belt lithologies and older gneissic rocks have been reported from the Cameron River volcanic belt, approximately 100 km northeast of Yellowknife, and from the Point Lake area, farther to the north (Baragar and McGlynn, 1976; Henderson, 1981). However, because most workers report that the unconformities have been modified by "later" faulting (e.g., Davidson, 1972; Baragar and McGlynn, 1976; Lambert, 1977; Henderson, 1981; Padgham, 1985), the significance of this deformation needs to be assessed. As part of an on-going investigation, I mapped the Cameron River Greenstone Belt and the Sleepy Dragon Metamorphic Complex in the vicinity of Webb Lake (85 I/14) and Sleepy Dragon Lake (85 I/15) during the summer of 1985, extending the earlier work of Davidson (1972) and Lambert (1974; 1977; 1982). Complimentary studies by W.K. Fyson and R. Cullen are currently in progress to the north of this study area.

LITHOLOGIES

The Cameron River Greenstone Belt consists predominantly of mafic to intermediate, pillowed and massive flows, and numerous dike and sill complexes (Lambert, 1977). The pillows typically have well-developed selvages and, in some places, exhibit mineral-filled amygdules. Empty and calcite filled feeder tubes are locally present and serve as a useful way-up indicator. Thick sills are difficult to distinguish from massive flows because of metamorphic overprinting of primary textures. Near the preserved base of the greenstone belt, gabbroic dikes locally exhibit a sheeted aspect and display one-way chilling. In many cases the dikes have altered chlorite- and epidote-rich centers, suggesting some interaction of hydrothermal fluids (sea water?) with the volcanic section (cf. Hoffman, 1985).

Several pyroclastic units have also been recognized, including a spectacular tuff with fiamme, which have been flattened both parallel to bedding and parallel to cleavage. The apparent lack of welding in this unit and the rounded character of some grains suggest that the tuff has been resedimented or deposited in a subaqueous environment. Euhedral to rounded blue quartz grains in the tuff have pressure shadows developed around them, defining a vertical lineation. Although present, volcanic breccias are scarce in the Cameron River Belt, in comparison with the Yellowknife Greenstone Belt (cf. Padgham, 1981).

Rocks of the Sleepy Dragon Metamorphic Complex are highly variable, and include orthogneisses, paragneisses, augen-gneisses, biotite and muscovite schists, and several foliated granitoid plutons (Davidson, 1972). Quartz ribbons are ubiquitous in the gneissic rocks, and close inspection reveals rootless isoclinal fold hooks in the foliation plane. Numerous mylonite zones cut the Sleepy Dragon Complex both obliquely and parallel to the local gneissic foliation. The mylonites show S-C banding, rotated porphyroclasts, and asymmetric pressure shadows; sense of shear determinations aimed at understanding their origin and significance are in progress. Older gneisses and mylonites are intruded by several younger phases of mafic to silicic plutonic rocks which show different states of deformation; using this feature together with cross-cutting relationships and, possibly, isotopic dates, it is anticipated that a structural chronology will be established for the Sleepy Dragon Complex. Mafic dikes are abundant near the contact with the Cameron River Greenstone Belt (Lambert, 1982). Both the texture and xenolith content of these dikes appear to be generally different from the dikes in the greenstone belt. Different suites of deformational and metamorphic fabrics in the dikes of the Sleepy Dragon Metamorphic Complex indicate that they belong to at least two, and probably three, generations. Work is currently under way to determine which, if any, of the Sleepy Dragon dikes were contemporaneous with intrusions in the Cameron River Belt (cf. Lambert, 1982).

BASEMENT-COVER RELATIONSHIPS

The contact between the Cameron River Greenstone Belt and the Sleepy Dragon Metamorphic Complex was found to be a

0.5 km wide zone of very complex structure. All rocks within this high-strain zone have a strong, steeply plunging, stretching lineation, although rocks from throughout the area also have a less-intense vertical lineation. Transposed layering and intensely folded or boudinaged quartz segregations are present in this zone; their style of deformation was found to depend on what their initial, undeformed orientation was. Sheath folds with vertically plunging hinges are common in some localities, indicating very high shear strains. Macroscopic sense-of-shear indicators are not abundant, but generally suggest that the Cameron River Belt was thrust over the Sleepy Dragon Complex. Supporting microscopic work is currently under way. In one area, north of Webb Lake, some thin slivers of gneissic basement are intercalated with phyllonites of the major high-strain zone. Kinematic indicators from this locality show that the volcanic belt has been thrust up against the Sleepy Dragon Complex, and imbricate faults sliced off pieces of the gneiss in the process. No other examples of basement-involved thrusting of greenstone belt lithologies are yet known from the Slave Province (J. Brophy, pers. comm., 1985).

Pillow lavas of the Cameron River Belt, immediately adjacent to the basal high-strain zone, typically have aspect ratios exceeding 1:3:10. In a less strained area to the northwest of Sleepy Dragon Lake, these lavas are overturned in an anticline, as shown by locally consistent facing directions. The axial trace of this fold is parallel to the basal high strain zone, and the fold's geometry is consistent with formation as ja hanging-wall anticline during thrusting of the Cameron River Belt over the Sleepy Dragon Complex. Preliminary mapping in the greenstone belt has revealed the presence of a few other subparallel shear zones containing structures similar to those just described; a common origin is tentatively inferred pending more detailed mapping. Thin mylonite zones were found as far as half way up from the base of the volcanic belt.

Interpreting the structures within the Sleepy Dragon Metamorphic Complex is difficult because of the complex deformation history of this terrane. The only structure which, at this point, can unambiguously be related to movement along the contact with the Cameron River Belt is a foliation which trends parallel to and increases in intensity towards the contact zone. The foliation cuts earlier structures, including folded gneissic and mylonitic foliations. The fact that this foliation is cut by some plutonic bodies, and is only partly developed in others, suggests that a minimum age may be placed on the deformation of the contact between the Cameron River Greenstone Belt and the Sleepy Dragon Metamorphic Complex.

CONCLUSIONS

Preliminary mapping of the Cameron River Greenstone Belt and the Sleepy Dragon Metamorphic Complex in the vicinity of Webb Lake and Sleepy Dragon Lake has revealed the presence of a major high-strain zone between the two distinct terranes. Sparse sense-of-shear indicators suggest that deformation of the contact is related to thrusting of the greenstone belt over the gneissic basement rocks. Imbrication and minor folding of the greenstone belt, as well as incorporation of slices of the basement into the basal shear zone, resulted from large displacements along this zone. Further mapping will be aimed at characterizing the style and geometry of this thrust zone, and will determine if relationships observed in the Webb Lake - Sleepy Dragon Lake area are valid for elsewhere in the Cameron River Greenstone Belt. An evaluation will also be made of whether this deformation is the result of the modification of an original unconformable relationship between gneisses and greenstones, or whether it is a consequence of the juxtaposition of two once widely separated terranes.

ACKNOWLEDGEMENTS

This work could not have progressed if it were not for the helpful discussions and logistical support of Bill Kidd, Bill Padgham, John Brophy, John Henderson, Maurice Lambert, Tony Davidson, Kris Saboda, Martin Irving, Bill Fyson, Declan Depaor, and Dwight Bradley. Funding was provided by the Geological Society of America and by the Johns Hopkins University.

REFERENCES

Baragar, W.R. and McGlynn, J.C., 1976:
Early Archean basement in the Canadian Shield: A review of the evidence; Geological Survey of Canada, Paper 76-14, 21 p.

Davidson, A., 1972:
Granite studies in the Slave Province; in Report of Activities, Part A; Geological Survey of Canada, Paper 72-1A, p. 109-115.

Henderson, J.B., 1976:
Geology of Hearne Lake (85I) and Yellowknife (85J) map areas; Geological Survey of Canada, Open File 353.

----------, 1981:
Archean basin evolution in the Slave Province, Canada; in Precambrian Plate Tectonics, Developments in Precambrian Geology 4, A. Kroner, ed.; Elsevier, Amsterdam, p. 213-235.

Hoffman, S., 1985:
The 3.5 B.Y. old Onverwacht Group: A remnant of ancient oceanic crust; in Workshop on the Early Earth: The

Interval from Accretion to the Older Archean, K. Burke, ed.; Lunar and Planetary Institute Technical Report, 85-01, p. 31-33.

Lambert, M.B., 1974:
Archean volcanic studies in the Slave-Bear Province; in Report of Activities, Part A, April to October, 1973; Geological Survey of Canada, Paper 74-1A, p. 177-179.

_____, 1977:
Anatomy of a greenstone belt, Slave Province, Northwest Territories; in Volcanic Regimes in Canada, A Symposium, University of Waterloo, May 16-17, 1975, W.R.A. Baragar and others, eds.; Geological Association of Canada, Special Paper 16, p.331 - 340.

_____, 1982:
Synvolcanic intrusions in the Cameron River Volcanic Belt, District of Mackenzie; in Current Research, Part A; Geological Survey of Canada, Paper 82-1A, p. 165-167.

Padgham, W.A., 1981:
Geology of the Yellowknife Volcanic Belt; in Proceedings of the Gold Workshop, Yellowknife, 1979, R.D. Morton, ed.; Yellowknife Gold Workshop Committee, p. 288-322.

_____, 1985:
Observations and speculations on supracrustal successions in the Slave Structural Province; in Evolution of Archean Supracrustal Sequences, L.D. Ayres, P.C. Thurston, K.D. Card, and W. Weber, eds.; Geological Association of Canada, Special Paper 28, p. 133-151.

GOLD POTENTIAL OF THE KETYET RIVER AND WOODBURN LAKE GROUPS TEHEK LAKE AREA, NWT

Pierre J. Laporte
District Geologist, Keewatin Region
Northern Affairs Program, Yellowknife

The Tehek Lake area, north of Baker Lake, is underlain by a volcano-sedimentary assemblage including ultramafic flows, felsic to mafic volcanic rocks, greywacke, pelitic rocks and white orthoquartzite. Banded iron formation outcrops with the sediments at or near the contact with the volcanics. The assemblage has been mapped as the Ketyet River Group in the Baker Lake map area and as the Woodburn Lake Group in the Amer Lake map area to the northwest. The Cullaton Lake area, site of the 8-Zone Gold Deposit, is underlain by a similar volcano-sedimentary assemblage.

To evaluate the gold potential of the Tehek Lake area, 106 samples were collected from outcrops and frost heave of iron formation: 42 from gossan zones, 20 from quartz veins; and 7 from carbonate-rich shear zones. All samples were analyzed for gold. Most samples of iron formation were also analyzed for silver, arsenic, tungsten, copper, lead, zinc and nickel. Some of the other samples were analyzed for Ag, Cu and a few for Pb, Zn, Ni. The samples were arbitrarily classified as highly anomalous (>340 ppb Au), moderately anomalous (>68 ppb Au), anomalous (>34 ppb Au) and possibly anomalous (>17 ppb Au). All but four of the possibly anomalous to highly anomalous samples were collected from seven distinct areas. The geology and distribution of samples in each of these seven areas are discussed and two areas are considered especially interesting.

CLAIM POSTS

John Matthews, B.C.L.S., C.L.S.

This talk will cover a few of the benefits to be derived from a legal survey of mineral claims. Solutions to positioning missing boundary posts and witnessed corners are discussed. Field operations required while making a legal survey are described, and suggestions for Locators to make claim boundaries more readily identifiable are discussed.

GOLD MINERALIZATION AT THE HOMESTAKE GOLD MINE

Larry Meier, Senior Geologist
Homestake Mining Company
Lead, South Dakota

The Homestake Gold Mine, discovered in 1876, is one of the oldest and largest continuously operating gold mines in North America. Production of almost 34 million ounces of gold to date has been derived from 128 million tons of ore.

Syngenetic gold mineralization is confined to the Archean Homestake Formation. This chemically precipitated iron formation is underlain by pelitic metasediments (Poorman Formation) and overlain by a package of pelitic to quartzitic rocks (Ellison Formation). A distal source for gold mineralization is inferred, as feeder zones within the immediate area have not been recognized.

The Precambrian sequence, in the Lead area, has been subjected to several pulses of deformation during a single metamorphic episode. This post-ore tectonism resulted in extremely complex structures and an increase in metamorphic grade from greenschist to amphibolite facies in a northeast transect across the mine area.

Ore bodies comprise only a small percentage of the Homestake Formation and

do not occur along any particular stratigraphic horizon or within a preferred structural position. Gold is associated with pyrrhotite and arsenopyrite. Increased amounts of vein quartz and chloritic alteration commonly accompanies this mineralization, along with minor, local remobilization due to metamorphism.

EARTH PHYSICS BRANCH ACTIVITIES IN THE NWT

Robert G. North
Earth Physics Branch
Energy, Mines and Resources
Ottawa, Ontario

The Earth Physics Branch conducts a range of activities aimed at ensuring the availability of geophysical information and expertise concerning the solid earth, its physical processes and geophysical hazards, as required for public safety and for management of the Canadian landmass and their related resources. It is organized into three divisions, two of which are in Ottawa and the third in Victoria, B.C. A number of employees are based in the NWT, including three in Yellowknife. The objectives of the branch are met through the following principal activities:

Development and maintenance of comprehensive data bases in the fields of seismology, geothermics, geomagnetism, gravity and geodynamics.

Analysis and interpretation of these data, in order to develop new concepts and understanding of the geophysical framework of Canada, and of its current and historical dynamics.

Assessment of earthquake and permafrost risks and hazards in Canada, including research on forecasting where applicable.

Application of expertise and knowledge to the solution of current national problems such as nuclear fuel waste management, nuclear test ban monitoring, the delineation of potential sources of geothermal energy, and the development of earthquake resistant construction standards for industrial facilities and conventional buildings.

In the NWT, gravity measurements are being made to complete the national data base. A network of magnetic observatories monitors changes in the magnetic field, allowing predictions to be made on both long- and short-term bases. Seismological observatories gather data from Canadian and worldwide earthquakes. Just outside Yellowknife, an "array" of twenty seismometers provides very accurate and low-noise data which is used in research aimed at verification of a potential nuclear test ban treaty; funds are presently being sought for an upgrade of this facility. Plans are being made, in conjunction with the National Research Council, for the possible installation of a large radio telescope near Yellowknife, which will be used for studies of the stability of the earth's crust and changes in the rate of the rotation of the earth, as well as for astronomical purposes.

On October 5 of this year, a large (magnitude 6.5) earthquake took place in the Mackenzie Mountains. It was felt in Yellowknife, over 400 km away. The relationship of this event to historical seismicity in the area will be discussed, and a description will be given of the status of the continuing studies of the earthquake.

A STUDY OF ALTERATION ALONG SHEAR ZONES WEST MIRAGE ISLANDS, YELLOWKNIFE BAY

Carolyn Relf
Memorial University

INTRODUCTION

The West Mirage Islands are about 22 km south-southeast of Yellowknife, at the mouth of Yellowknife Bay. Current research being carried out in the islands includes geological mapping (approximately 1:2500) and a study of the amount and type of alteration along shear zones in the area. To date, the mapping has been done and a systematic sampling across shear zones has been completed.

GEOLOGY

The West Mirage Islands lithologies are correlated to the Banting Group of the Yellowknife Supergroup. They are characterized by felsic to intermediate volcaniclastic rocks, including fragmental tuffs and tuffaceous sediments, and local breccia horizons and debris flows. Mafic tuffs are near the bottom of the volcanic pile, and amygdaloidal pillowed basaltic flows up to 100 m thick are present in the top half. A felsic plagioclase-porphyritic unit shows both comformable and crosscutting relationships with the volcanics, and is interpreted to be late syn-volcanic in age.

The volcanic sequence is intruded by a number of felsic, flow-banded aphanitic dykes, and by at least four generations of gabbro dykes. Near the bottom of the pile, the gabbro is (at least locally) pre-felsic dyke in age, while higher up, the gabbro consistently crosscuts the felsic dykes. The lower gabbros may be feeders to the mafic flows overlying them.

The westernmost islands are intruded by tonalite and gabbro. In places they appear to have been intruded synchronously, and are characterized by gradational,

ill-defined contacts. Elsewhere, younger gabbro dykes clearly crosscut both lithologies.

Granitic veins intrude the early tonalite-gabbro sequence, and are cut by later gabbros. These veins are believed to be related to the Western Granodiorite, which crops out on the mainland northwest of the islands.

STRUCTURE AND METAMORPHISM

The rocks on the West Mirage Islands form one limb of a large syncline whose axial plane strikes northeast and dips near vertically. The lithologies along this limb strike east, with tops facing north, in contrast to their stratigraphic equivalents along the west shore of Yellowknife Bay, which strike northeast and young southeast.

Locally there are tight to isoclinal folds in the tuffs and tuffaceous sediments, marked by reversals in the facing direction.

A moderate to strong, steeply dipping, east-trending foliation is developed in the intrusive sequence in the western islands. This foliation is weak to absent in the volcanic rocks further east.

The metamorphic grade varies across the area, from greenschist facies in the east and central islands to lower amphibolite in the west.

SHEAR ZONES

A series of steeply dipping shears cut both the volcanics and the intrusive rocks. They are most abundant in the gabbros and commonly trend easterly.

Where they cut the gabbro, these shears are characterized by strongly schistose zones rich in chlorite. Quartz, sulphide minerals, and less commonly carbonate accompany the alteration in the shear zones.

Shears in the volcanic sequence vary in appearance. Sheared mafic volcanics are marked by steeply dipping chlorite schist, with or without quartz and/or sulphides. Shears in felsic and intermediate volcanics locally show protomylonitic textures.

Samples of both sheared and unsheared rock were collected. Shears with widths of more than 2 m were sampled near the edges and in the centres. Quartz, when found along shears with a texture that indicated equilibrium with the minerals in the shear zone, was sampled along with chlorite.

Analytical work on the rocks will include oxygen isotope studies of equilibrated quartz-chlorite pairs to determine the equilibrium temperatures in the shear zones.

Whole-rock geochemistry and microprobe analyses will be carried out on the samples to determine the extent of hydration of the sheared rocks relative to their unsheared equivalents, and whether the shears are characterized by any marked enrichment or depletion of mobile elements.

Calculations will be done to determine the minimum volumes of fluid which have passed through the shears, and the compositions of these fluids.

REFERENCES

Helmstaedt, H. and Padgham, W.A., in press:
A new look at the stratigraphy of the Yellowknife Supergroup at Yellowknife, NWT - implications for the age of gold bearing shear zones and Archean basin evolution; Canadian Journal of Earth Sciences.

Helmstaedt, H. and others, 1981:
Geology of the southwest end of the Yellowknife Greenstone Belt; in Proceedings of the gold workshop, Yellowknife, 1979, R.D. Morton, ed.; Geo-workshop Committee, Yellowknife, p 232-249.

Henderson, J.F. and Brown, I.C., 1966:
Geology and structure of the Yellowknife Greenstone Belt, District of Mackenzie; Geological Survey of Canada, Bulletin 141, 87 p.

MINERALOGICAL AND ECONOMIC GEOLOGY EVALUATIONS THOR LAKE RARE METAL DEPOSITS, NWT

D.G.W. Smith
Department of Geology,
University of Alberta.

This year the rare metals deposits at Thor Lake have been the subject of substantial further research and exploration by Highwood Resources Ltd. The contractor's graduate student, Miss Louise de St. Jorre, has worked with Highwood throughout the summer months and has been involved in much of the further exploration, including the mining operations. This involved putting in a 480 m decline which passed through the five beryllium zones of the T-zone ore body. It provided a unique chance for Miss de St. Jorre to complete the sampling of the body for her study of the REE mineralogy, as well as an excellent opportunity to reassess the spatial and genetic relationships of the various zones present. It is anticipated that Miss de St. Jorre will complete her study and submit an M.Sc. Thesis to the University of Alberta early in 1986.

Earlier work has shown that unusual, possibly new, zirconium-silicates are present in some rocks from the T-zone. The ion microprobe at Cambridge, England, was used to look at the elements; hydrogen,

lithium, beryllium and boron in some of these samples. This instrument permits the detection of light elements that either cannot be detected by the electron probe or can only be detected with difficulty, while at the same time offering a spatial resolution during analysis which approaches that of the electron probe. The work showed that the two Zr-silicates, which are intimately intergrown in a zonal manner, are both hydrous and also that both contain Be, while one contains Li and the other B. In addition, the Be- and B-bearing Zr-silicate contains much more water, as well as several percent uranium and several percent yttrium. Apparently these are both new Zr-silicate minerals.

Exploratory cathodoluminescence microscopy was also carried out at Cambridge. This shows considerable potential for revealing the modal amounts of cathodoluminescent minerals that are present, as well as for highlighting certain textural features. It is hoped to be able to use the facilities at Cambridge again later this year in an investigation of the gallium distribution in feldspars from the Thor Lake deposit.

This summer two suites of samples were collected: one from samples produced by the mining operation; and one from the Lake Zone. The latter were taken from various drill cores under the guidance of Miss Kim Hudson, who had been logging this core for Highwood Resources this summer. These rocks will, it is hoped, form the basis of another Master's degree; this one on the mineralogy of the Lake Zone deposits.

On September 15th a paper entitled "The Thor Lake, NWT Rare Metal Deposits" was given at the CIM Conference on Granite-Related Mineral Deposits in Halifax, by D.L. Trueman, C. Pedersen, L. de St. Jorre and D.G.W. Smith. The poster session, made up initially for this year's MAC/GAC meeting in Fredericton, was also on display.

THE BULLMOOSE LAKE PROJECT

Steve Swatton
University of Alberta

INTRODUCTION

As a result of recent geological mapping and consideration of subsurface data, a working model is presented to explain the auriferous veins at the Bullmoose Lake property, NWT (coordinates 62°17'N 112°44'W). This model advocates that the auriferous veins developed in structurally anomalous areas which can be explained by considering at least three phases of folding. The first phase, a period of regional slumping during the Archean, was closely followed by a phase of localised thrust/strike-slip movement on the limbs of the F1 folds (Fig. 10). It is apparent that the significantly high gold (Au) values found on the property ("ore grade" material) are associated with this second phase of folding. The third phase of folding, a regional east-west compression, may be an important factor in further concentrating the gold but the significance of this event with respect to the mobilization of gold is not yet fully understood.

SIGNIFICANT FINDINGS

On a property scale (1"=400'), lithologies are classified as follows:

1. Well-bedded, incomplete meta-Bouma sequences (metagreywackes);
2. Dominantly metapsammites;
3. Dominantly metapelites.

The three different lithological types have been tentatively drawn on a cross-section (Fig. 7) of the immediate mine area. A Bouma sequence can be recognized in outcrop by careful observation of several phenomena which have either been preserved or generated during metamorphism. A Bouma sequence of metamorphosed rocks is characterized by grain size reversal. Large cordierite porphyroblasts develop in the pelitic layers at the top of each unit.

Ideally, if a knife is drawn across the unit, the coarser arenaceous layer at the base of each unit scratches the blade, whereas the fine constituents at the top of the unit are easily scratched by the blade. Many of the beds are either composed almost entirely of either the arenaceous or the pelitic fractions; in these cases tops cannot be determined. A gradual increase in the concentration of cordierite should be observed towards the top of each unit to confirm the top of the beds by lithological methods. This gradual increase in cordierite concentration has been noted in some diamond drill core but is more easily recognized in outcrop (Fig. 8). Grain-size boundaries, on the other hand, are common in the core. These grain-size differences represent an erosional contact and their recognition can help considerably in determining the attitude of the beds.

The tops of the beds can also be determined structurally. A feature of some of the Bouma sequences is a cross-cutting stratabound vein (Fig. 9); a good example of which is exposed 20 ft east of the assay lab. These types of vein are not common but sometimes a strain field, analagous to the strain field which produces a stratabound vein, is seen in the orientation of the cordierite within a unit. Tops can be determined by observing the deflection and thinning of a quartz vein as it traverses through a competent arenaceous layer into a less competent argillaceous top.

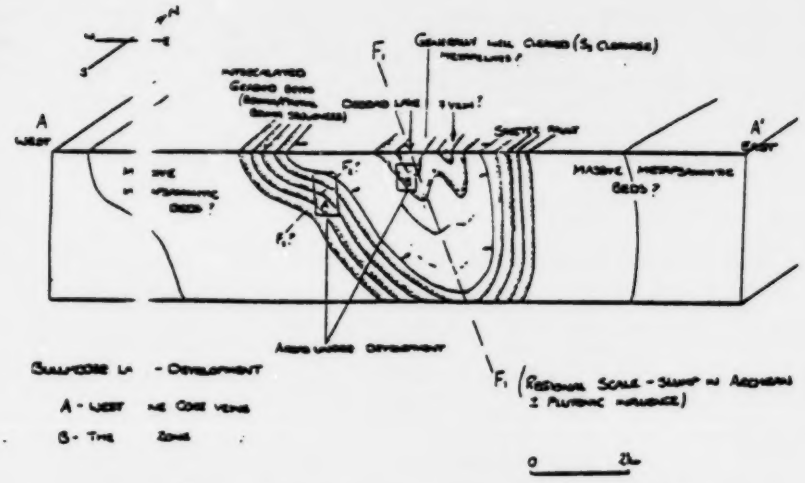


FIGURE 7: Simplified, inferred geological cross-section of the Bullmoose Lake Property.

FIGURE 8: Core material displaying tops (BU-84-22).

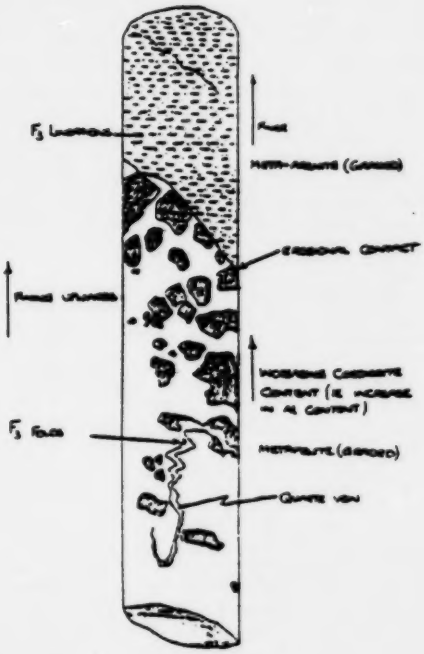
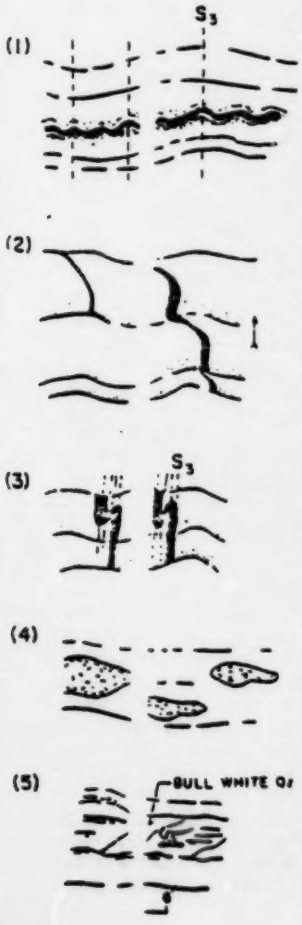


FIGURE 9: Habit of quartz veins and segregations at Bullmoose Lake, NWT.



SYN-F1:
Bedding veins (parallel to bedding). Occur throughout the property and are well developed in well bedded areas. Location: West zone core veins.

PRE- AND SYN-S2,S3:
Stratabound veins. Lie within but oblique to beds. Deflection of the vein due to the competency contrast of individual units. Defines the tops of the beds. Location: South of Cominco shaft and next to Assay Lab.

PRE- AND SYN-S2,S3:
Foliation veins. Parallel or subparallel to foliation. Localised throughout property - West zone core vein area, 7 vein?, 9 vein.

SYN-DEFORMATION:
Quartz segregations, irregular shaped bodies (blue-grey and bull white quartz). Location: Found throughout property, particularly in metapsammitic units.

POST BLUE-GREY QUARTZ
Bull white quartz veins. Often cut earlier blue-grey quartz. Location: Found throughout mineralized and unmineralized areas, particularly noticable in 7 vein.

LITHOLOGY LAB WORK

Samples of each type of unit described have been collected and will be sectioned to try and determine if the bedding (S1?) is accompanied by an F1 fabric.

PROPERTY GEOLOGY WITH PARTICULAR REFERENCE TO THE AREAS MAPPED DURING THE 1985 FIELD SEASON (JUNE to SEPT)

The bedding seen throughout the area (C3, C4 and part of the D4 map sheets) has been plotted at 1" to 100' scale. It is apparent from the mapping that the bedding has defined a gently northerly plunging F1 syncline (Fig. 10) whose axial trace trends about 340° (mine north). No visible schistosity developed with this phase of folding, and it is presumed that this early phase was associated with regional slumping of the sediments during the Archean. It is conceivable that some of the folds produced during this early phase of folding were drag folds. The geometry of this syncline is believed to be tight and overturned on its eastern limb.

Superimposed onto the western limb of the F1 syncline is an "S" fold (F2?). This later fold is best exposed just north of 4L trench. The idea of a later fold is not a new concept (Company reports by Michel, 1976; Darch, 1981) but the data supporting its geometrical relationships were not clear. Underground development in the west zone core veins has recognized an "ore zone" which plunges at about 70° in a

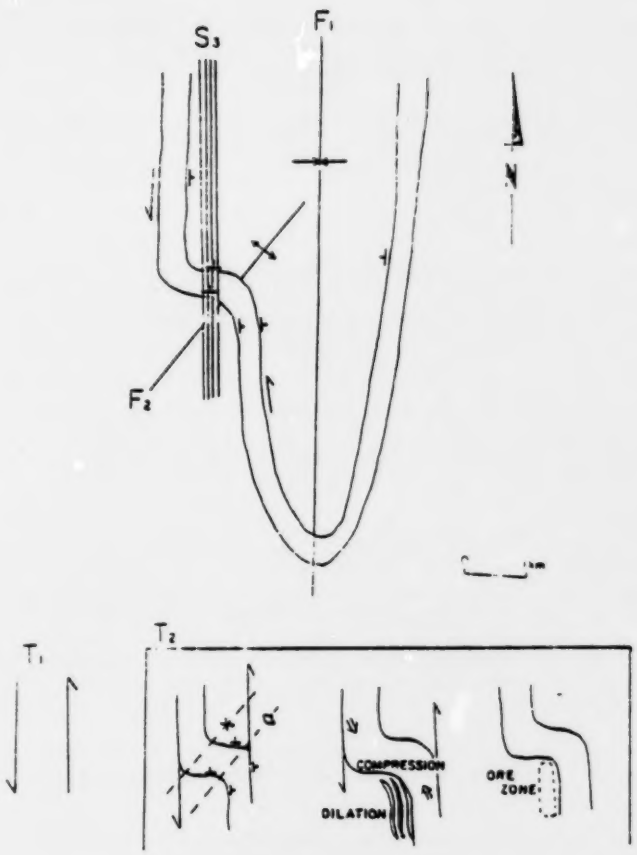


FIGURE 10: Property geology guide and possible mechanism for structures seen at Bullmoose.

northeasterly direction. It is proposed that this plunge represents the hinge zone of the F2 fold. It is of particular note that the better mineralized veins are on the southern limb of this F2 anticline. By analogy with some of the quartz veins seen throughout the property, it is believed that the fold was produced by a shear-type motion (Fig. 10). It is possible that the mineralization ceases on the northern limb of the F2 anticline because the stresses being produced during this phase of deformation were causing compression on the northern limb and dilation on the adjacent southern limb. The fluids and gold were directed to this area of lower stress. Fluids would be preferentially concentrated near the hinge of the F2 fold and presumably is the reason why the best gold values are located in a zone which plunges at 70° northeasterly.

7 VEIN

The 7 vein, consisting of a blue-grey and white quartz vein, plunges southerly in the axial plane of an isoclinal, overturned F1 fold. The vein was probably generated by migration of quartz from the country rock. Superimposed shearing could account for the inclusions of deformed wallrock within the vein. The later white quartz was probably introduced along fracture planes which were developing whilst the rock was under the stress of left-lateral motion.

11 ZONE

The 11 zone occupies the nose of the F1 syncline. Shearing has brecciated the quartz.

14 ZONE

The 14 zone is a minor shear zone with an anonomously high amount of biotite associated with a sulphide vug. This vug assayed 17 oz/ton Au over 2 feet. Other samples from the immediate vicinity were anonomously high, up to 0.87 oz/ton Au.

15 VEIN

The 15 vein (formally Cominco 7 vein), east of the airstrip road (45+00N/7+00W), is a north-south trending, blue-grey vein approximately 200 ft in length. The vein varies in width with an average of about 0.8 ft. Samples taken at 3 ft intervals along its entire length produced consistant assays of about 0.08 oz/ton Au (over 4 ft widths) with 0.34 oz/ton Au recorded at its northern extension. Sulphide-rich "zones" along the length of the vein did not return assays above 0.08 oz/ton Au.

MINERALOGY

The mineralogy of the veins has been fairly well documented in previous reports but thin sections will aid in determining the nature of the mineralogical intergrowths and/or alteration products. The associations of pyrrhotite, pyrite, chalcopyrite and other minerals such as native copper, galena, arsenopyrite and molybdenite will be investigated. The possibility that the Mg/Fe ratio in the mica varies adjacent to gold-bearing veins will be studied. The blue-grey quartz will be probed on the SEM to determine the cause of the colour (possibly amorphous carbon, rutile or strain fields produced during the deformational history of the quartz).

SOURCE AND EMPLACEMENT OF Au

The ultimate source of the gold in these types of deposits is still being debated, but it is possible that it was derived from the Yellowknife Volcanics and transported into the adjacent basins with volcanic wackes. The Yellowknife sediments were, therefore, presumably enriched in Au (possibly as high as 5 ppb - J. Brophy, personal correspondence).

Sediments of the Bullmoose district (Burwash Formation of the Yellowknife Supergroup) were metamorphosed to amphibolite grade during the Archean and it is conceivable that the Au was "sweated" out of the sediment pile during this metamorphism. The quartz was probably

mobilized out of the basal Bouma sequence beds into bedding-parallel veins during prograde metamorphism. These veins were emplaced at the boundary between the base of the arenaceous and the top of the argillaceous units because this was a zone of minimum stress during the progressive deformation of two different rock fabrics. Dilation was probably produced by internal shearing of mica within the argillaceous layer. The Au was presumably carried with the fluids which were released during the dewatering of the argillaceous component. In either the argillaceous or arenaceous massive units, bedding-parallel veins are not found in abundance because either the source or the "reservoir" for the quartz was not available. In the field, over 100 bedding-parallel veins were sampled at 3 ft. intervals and assayed for Au (fire assay). The results, on average, show an increased Au value for the veins over the background values of the wallrock. Typical assays for the bedding-parallel veins ranged from 0.002 oz/ton to more than 3 oz/ton, whereas few wallrocks assayed more than a trace of gold (less than 0.002 oz/ton).

Detailed surface and underground mapping of the ore-grade Au veins (greater than 3 oz/ton) has defined localised structural anomalies which appear to either host the gold or to have acted as a mechanism for concentrating the gold. The F2 shear action which is probably closely associated with the F1 deformation (mass slumping) produced dilatency at specific locii (Fig. 10). Fluids, which were probably either derived from a later hydrothermal event or from the circulation of mesothermal meteoric waters (results from ongoing fluid inclusion and isotope studies will help to determine the probable source of the fluid), were directed towards the hinges of the F1 and, more significantly, the F2 folds. Bedding-parallel veins that were generated during the early stages of metamorphism were folded by the F2 deformation, indicating that it was possible for the secondary fluids associated with the F2 event to scavenge Au (and sulphides) from the already concentrated bedding quartz veins. The efficacy of S3 (F3) as a gold enhancement process is difficult to determine. Stresses operating during this phase of folding were presumably directed east-west to produce a north-trending schistosity. It would appear that F3 forces would not help gold enhancement, yet in the area of the high-grade west zone core veins, bedding lies parallel to S3, inferring that F3 folding produced important gold concentration.

CONSIDERATIONS

The better mineralized areas appear to require:

1. An area with well-bedded sequences (Bouma units);
2. A structural anomaly other than F1. It is possible that an F1 and F2 combination may be required to produce ore-grade material; the hinge and/or axial plane of both folds have to be in close proximity;
3. Sulphide mineralogy may be significant, but at this time its use as a prospecting tool is poorly understood.

CON MINE SHAFT DEEPENING PROJECT

Michael Winship, Richard Smith
Cominco Ltd., Con Mine
Yellowknife

The Cominco Con Mine in Yellowknife has produced gold since 1938. In 1983 a decision was made to deepen the Robertson shaft 800 feet and develop four new levels for production.

This project was technically challenging as all men, materials, and muck from the operating mine had to be continued to be moved through the Robertson shaft during the deepening. The formidable task of roping up the deepest friction hoist shaft in the Northern Hemisphere also had to be tackled.

Primarily a slide presentation, the talk will focus on the two main phases of the Project:

1) the shaft sinking and
2) the hoist rope-up.

PROGRAM---13TH ANNUAL GEOSCIENCE FORUM

KATIMAVIK ROOMS EXPLORER HOTEL, YELLOWKNIFE, DECEMBER 3-5 1985

9:00 - 09:30 **WELCOME AND INTRODUCTION**

Dave Nutter, N&T Chamber of Mines
Charles Dent, Deputy Mayor, City of Yellowknife
Gilles Patenaude, DIAND

OPENING SESSION,
CHAIRMAN: DAVE EMERY, PRESIDENT
GIANT YELLOWKNIFE MINES LTD., YELLOWKNIFE, N&T

09:30	Role of the Native Development Corporation	Jake Heron, President Metis Development Corp. Jim Britton, Consultant Nunasi Development Corp.
10:30	COFFEE	COURTESY AERO ARCTIC
10:50	Native Land Claims Negotiations	Larry Tourangeau, Pres. Metis Association
11:20	Aviation Safety	Tom Chafchuk Regional Aviation Safety Officer Department of Transport
12:00	LUNCH	COURTESY N&T AIRWAYS

AFTERNOON SESSION,
CHAIRMAN MIKE CUNNINGHAM
GIANT YELLOWKNIFE MINES, YELLOWKNIFE, N&T

13:00	Ian McCartney Pine Point Mines Pine Point, N&T	The use of Geochemistry in exploration for lead zinc at Pine Point.
13:35	R.D. Morton, D.G.W. Smith, Department of Geology University of Alberta	Application of some modern mineral identification techniques to exploration and deposit development.
14:05	D. Trueman Highwood Resources Calgary	Development of the Thor Lake Beryllium deposits.
14:30	COFFEE	COURTESY AERO ARCTIC
14:50	Geoff Thurlow CAC/MDD H.S. Robinson Memorial Lecturer	Geology of the Buchans Mine; Paleozoic Volcanogenic Massive Sulphide Deposits.
15:15	W.S. Fyfe Department of Geology University of Western Ontario, London	Gold and Global Tectonics
15:45	M. Winship, R. Smith Con Operations, Yellowknife	Con Mine Shaft Deepening Project.
16:15	W. Nelson Panaretic Oils Ltd. Calgary	Type of Copper Mineralisatfon within the Proterozoic Upper Shaler Group and the Natkusiak Formation.
19:30	COCKTAILS	20:30 CIMM DINNER SPEAKER: Geoff Thurlow CAC/MDD, H.S. Robinson Memorial, Lecturer: Exploration lessons learned at Buchans, 3-D space is a very big place.

Cost $35.00 includes bar and wine

WEDNESDAY, DECEMBER 4TH

08:45 - 16:30 **MORNING SESSION, GOLD EXPLORATION IN THE N&T.**
CHAIRMAN, TED BATCHELOR
COMINCO LIMITED, YELLOWKNIFE, N&T

08:45	J.A. Brophy NAP GEOLOGY DIVISION	Gold Deposits of N&T An Overview
09:15	P.J. Laporte NAP Geology Division	Gold Potential of Ketyet River and Woodburn Lake Groups, Tehek Lake area.
09:35	R.D. Hoss, N.L.Trapnell Suncor Ltd. Calgary	Suggested controls for gold occurrences in the Cullaton Lake area, N&T
10:00	COFFEE	COURTESY AERO ARCTIC
10:20	Tim Henneberry Terra Mines Limited Edmonton, Alta.	Geology of the Bullmoose Gold Deposits
10:45	Juan Chelles Giant Bay Resources Vancouver	Geology of the Giant Bay gold deposit, Gordon Lake, N&T
11:10	Karen Mann Echo Bay Mines Ltd. Edmonton, Alta.	Exploration around the Lupin Mine
11:40	LUNCH	

N&T CHAMBER OF MINES, ANNUAL BUSINESS MEETING
Caribou Room, Yellowknife Inn ($15.00 lunch).

AFTERNOON SESSION GOLD EXPLORATION continued
CHAIRMAN, TONY RANSOM
GIANT YELLOWKNIFE MINES, YELLOWKNIFE, N&T

13:45	John Kerswill GSC, Economic Geology and Mineralogy Division, Ottawa	Gold mineralization, hosted by iron formation in the Contwoyto Lake area, N&T
14:10	Larry Meier Senior Geologist Homestake Mining Co.	Gold Mineralization at the Homestake Gold Mine, Lead, South Dakota.
014:40	Peter Thompson Precambrian Geology Division, GSC, Ottawa	Metamorphosed Iron Formation Occurrences in the Yellowknife Supergroup east of Bathurst Inlet
15:05	R.A. Frith Precambrian Geology Division, GSC, Ottawa	The Indin Structural Basin: Tectonic History and its Significance to Gold Exploration
15:30	COFFEE	COURTESY AERO ARCTIC
15:45	Nigel Casthorn Echo Bay Mines	Geology of the Lex Lake gold prospect, Indin Lake, N&T
16:10	Brian W. Mackenzie Dept. of Geol. Sc. Centre for Resource Studies Queen's University	Economic guidelines for gold exploration

CHAMBER OF MINES ANNUAL DINNER, Caribou Room, Yellowknife Inn

18:30 CASH BAR 19:00 DINNER Cost $35.00
Speaker Hon. Tagak Curley
Minister of Economic Development and Tourism
Government of N&T

THURSDAY, DECEMBER 5TH

09:00 11:15 MORNING SESSION NAP GEOLOGY DIVISION PROGRAM 1985
CHAIRMAN, MARK SENKIW
COVELLO and ASSOCIATES, YELLOWKNIFE, NWT

09:05	W.A. Padgham Geology Division NAP	Overview
09:15	Daniel Kerr University of Ottawa	Depositional environments during a glaciolacustrine to marine transition in the basin of the Richardson and Rae Rivers, NWT.
9:40	Val Jackson Geology Division, NAP	Mapping Quyta Lake and Hepburn Island areas
10:05	COFFEE COURTESY AERO ARCTIC	
10:25	Gordon Bailey Queen's University Kingston	Stratigraphic relations in the upper part of the Yellowknife Volcanic Belt
10:50	Brad Johnson Carleton University Ottawa	The Wilson Island Group in the East Arm of Great Slave Lake
11:15	W. D. Groves* P. Gannon *Archean Resources Corp. Geological Consultant Vancouver B. C.	Speculations on the Origin of Rare Earth-Carbonatite Systems
11:40	LUNCH	

AFTERNOON SESSION
CHAIRMAN, PIERRE LAPORTE
NAP, GEOLOGY DIVISION, YELLOWKNIFE

13:00	John Matthews MacIlhanney Surveys Vancouver, B.C.	"Claim Posts". Experiences finding and not finding location posts when making legal surveys on claims.
13:25	Bob North Earth Physics Branch	Earth Physics Branch Activities in the NWT.
14:00 - 15:20	1985 GEOLOGICAL SURVEY OF CANADA PROGRAMS IN THE NWT	
14:00	Simon Hanmer, GSC Precambrian Geology Division	The Great Slave Lake Shear Zone (GSLSZ), NWT: SE boundary of the Slave Craton.
14:30	COFFEE COURTESY AERO ARCTIC	
14:50	C. Jefferson Economic Geology and Mineralogy Division GSC, Ottawa	Preliminary Mineral Resource Assessment Surveys of proposed Wager Bay and Nahanni Extension Parks, NWT
15:25	Ken Dawson, GSC Economic Geology and Mineralogy Division Vancouver	"A New Belt of Silver Lead Zinc deposits, in the Cassiar terrain in the Northern Cordillera"
15:55	Precambrian Geology Division, GSC, Ottawa W.A. Padgham, NAP Yellowknife	Overview GSC 1986 Proposed NWT Program. DIAND, NAP, Geology Division Program, 1986
19:00	CHARLES CAMSELL FESTIVITIES KATIMAVIK B	
20:00	Dr. B. Riley McClelland University of Montana; US National Park Service Soaring with Eagles, Glacier National Park to the Arctic Circle	

POSTER SESSION

A number of displays of the current output of the NAP Geology Division, and the Geological Survey of Canada will be presented.

This year the poster session will feature displays of core, rock and mineral specimens from NWT mines, and important mineral deposits arranged in cooperation with the NWT Chamber of Mines. We will have core displays from Con, Lupin, Homestake and Salmita mines; from Noranda's Tundra Project, Echo Bay's Kim Property (near Indin Lake), and Highwood's Thor Lake beryllium-rare earth deposits.